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SPONGES.

BY BRYCE M. WRIGHT, JR.

Do sponges belong to the animal or vegetable kingdom seems to be the first question which presents itself to our mind in investigating these curious organisms, and this question involves a definition of a boundary line between the two kingdoms, which, of all the most perplexing queries that can be found for an unlucky naturalist, perhaps is the most difficult. Eminent zoölogists have, at various times, ranked them as belonging to the class of Zoöphyta, but others equally clever have disputed this right, and have claimed them as belonging to the vegetable kingdom. In the celebrated work of Dr. Johnston on British Zoöphyta, he disposes of them in a very summary manner. The following extract deserves attention: "if they are not the production of polypes, the zoölogist who retains them in his province must contend that they are individually animals, an opinion to which I cannot assent seeing that they have no animal structure or individual organs, and exhibit no one function usually supposed to be characteristic of the animal kingdom. Like vegetables they are permanently fixed; like vegetables they are non-irresistible; their movements, like those of vegetables, are extrinsical and involuntary;

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their nutriment is elaborated in no appropriated digestive sac, and, like cryptogamous vegetables or algæ, they usually ramify and grow in forms determined by local circumstances, and if they present some peculiarities in the mode of the imbibition of their food, and in their secretions, yet even in these they evince a nearer affinity to plants than to any animal whatever." This argument is certainly very favorable to their classification with plants, but there are other arguments by zoölogists equally clever in favor of their classification with animals. Linnæus seems to have changed his opinion several times respecting them. In the commencement of his great work he considered them as plants, or at all events as very doubtful animals; but in a later edition of his "Systema Naturæ," he seems to have admitted them along with the zoöphytes in the animal kingdom. In the opinion of Pallas, deBlainville, and others, they are intermediate organized bodies, without any determinate form, and with little susceptibility of feeling, but presenting an absorbent surface, and nourished pretty nearly like vegetables by the surrounding medium.*

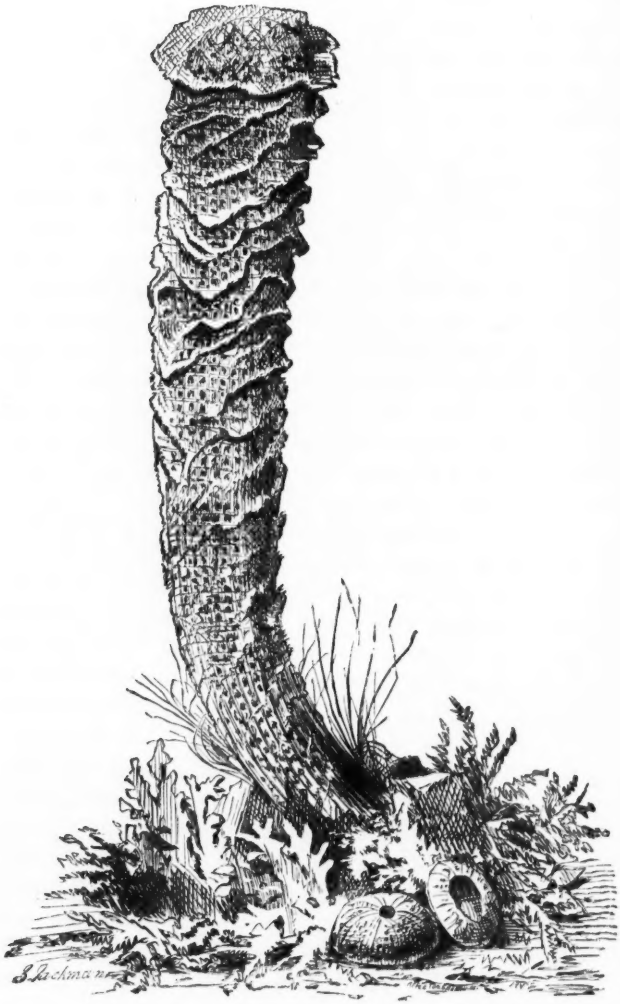
Sponges consist of a framework, or skeleton, coated with gelatinous matter, and forming a non-irritable mass, which is connected internally with canals of various sizes. The ova are very numerous, and present in appearance the form of irregular shaped granules derived from the gelatinous matter, which grow into ciliated germs and falling at maturity into the small canals, are then expelled by the orifices. When alive the body is covered by a gelatinous film, which, being provided with cilia causes a current of water to pass in at the smaller pores and out at the larger apertures, the sponge probably assimilating the nutritive particles which enter into the water. Papers have been written from time to time endeavoring to prove that the pores palpitate, but this has been stoutly denied, and perhaps the cause of their

* The sponges are, by the most advanced zoölogists, considered to be undoubtedly animals; all botanists reject them from the vegetable kingdom.— *Editors.*

being moved in such a manner as to give rise to this discussion is in consequence of the action of the water in passing through them. According to the analysis of sponges by Hornemann, they consist of a substance "similar to osmazone, animal mucus, fat oil, a substance soluble in water, a substance only soluble in potash, and traces of chloride of sodium, iodine, sulphur, phosphate of lime (?), silica, alumina, and magnesia." The quantity of silica which constitutes the structure of sponges is remarkable. It generally occurs in the form of spiculæ in considerable quantities, embedded in the substance or body of the sponge. In the species of Halichondria, the silicious spiculæ are pointed at the extremities, whilst the spiculæ of some are pointed at one end only, and are round at the other; sometimes they appear cylindrical, curved, or straight. The spiculæ of the genus Pachymatisma are often sharp at one extremity and at the other expand into two points; some are sharp at one end and expand at the other into three points; the *P. Johnstoniæ* can be taken as an example of the latter. The genus Tethea possess silicious spiculæ having hooks at both ends, and amongst the genera Grantia, Geodia, and in the Levant Sponge, the spiculæ are very large and radiate into three directions like a three pointed star. When properly mounted they form very beautiful microscopic objects. The spiculæ of the *Grantia nivea* show them to be of the triradiate, or three pointed, star shape, those of the *Halichondria Griffithii* in the form of pins, whilst those of the common sponge, from the Philippine Islands, are sometimes in the shape of crutches or stars. In the common Madrepore Sponge (*Dactylochalix pumicea*) the silicious element is fully developed as the whole mass is composed of this extremely hard substance, which is disposed in tubular and radiating canals. One of the rarest, and I may say most beautiful of the silicious sponges, is the *Euplectella** *speciosa* Gray (Fig. 76). It is described in the "Transactions of the Zoological Society

* *Eu*, well; and *pleko*, I weave.

Fig. 70.



of London," by Prof. Owen, as the *Euplectella aspergillum*, from the fact of its being in shape like the common *Aspergillum Javanicum* of Java. "Mr. Cuming" says Prof. Owen "has entrusted to me for description one of the most singular and beautiful as well as the rarest of the marine productions, with which his researches in the Philippine Islands have enabled him to enrich the zoölogical collections of his native country." The first specimen of this remarkable sponge was purchased by Mr. Cuming, the celebrated conchologist, at the death of Mr. William J. Broderip, who had formerly given the sum of £30 to become the possessor of this then unique Euplectella. This specimen, the only one known for a great many years, is now in the possession of the authorities of the British Museum in England, by whom it is greatly prized in consequence of its possessing the gelatinous film in its natural state. It certainly is one of the most curious and extraordinary combinations of fibrous and silicious structure which the bed of the ocean has ever yielded up to the researches of the naturalist. It differs materially from any sponges with which we are acquainted, being regular in its form. It is of cornucopia shape, and has a horny skeleton-like network, composed of large silicious fibres running from the base to the head, surrounded by smaller fibres, forming square open meshes resembling a net or basket-work. It ranges in height from six to even fifteen inches. At the lower extremity, or root, it averages about an inch in thickness, but its size gradually increases as it approaches the top, where often it is two inches wide. It is surmounted by a ridge about quarter of an inch wide, and is closed at the larger extremity by a delicate open lace work of fibres possessing no particular pattern. It is on this light and pretty structure that the fibrous gelatinous substance rests, resembling in texture the common sponge, but in this instance disposed in an irregular foliated pattern, over which the usual film of the sponge is laid during life. The base or root attaches itself to almost anything which may serve as a sup-

port; some being fixed to rocks, others to shells, and indeed any submarine objects which may present a surface strong enough to answer the purpose required. It is remarkable, but nearly all the specimens I have examined of this sponge have had enclosed in them a common hermit or soldier-crab. How this pugnacious member of the crustacean class becomes imprisoned it is difficult to conceive. Dr. Gray, of the British Museum, in speaking of them in "Land and Water," a London periodical, says that "the natives of the Philippine Islands deny that they are sponges, but say that they are formed by the crabs that are usually found in them, and that a pair of crabs form two close together. Hence they regard two specimens, as we should call them, a single individual." They consist of pure silica, and Mr. C. G. Brewster, naturalist, Boston, to whose courtesy I am indebted for the accompanying faithful engraving, has several specimens which, having lost their outer covering or film, have been cleaned by being placed in a weak solution of chloride of lime, and afterwards exposed to the action of the atmosphere. The Euplectella is found principally near the island of Zebu, one of the Philippine's, where the first specimen was obtained by the late Hugh Cuming.

The forms of sponges are very irregular, some being branched, others round or pear-shaped, and others resembling a cup, like the well known "Neptune's cup" of the Indian Seas. During life they are extremely beautiful in colors, possessing tints which it would be impossible to describe, and which I do not think have ever been faithfully represented in consequence of their beauty departing immediately after life ceases. Dr. Johnson states that the green color of the fresh-water sponge (*Spongilla fluviatilis*) depends upon the action of light, as he has proved by experiments which showed that "pale-colored specimens became green when they were exposed for a few days to the light and full rays of the sun; while on the contrary, green specimens were blanched by being made to grow in darkness or

shade. All sponges are aquatic, and with few exceptions marine. They attach themselves to all manner of objects which may present a point of support, whether floating or fixed; some select their abode on very unexpected objects. In one case recorded in the "Natural History of British Sponges," by Dr. Johnson, a specimen belonging to the genus Halichondria, a sponge not uncommonly found on some of our coasts, was discovered growing from the back of a small live crab,—"a burden" says the learned Doctor, "apparently as disproportionate as was that of Atlas,—and yet the creature has been seemingly little inconvenienced with its arboreous excrescence." The fresh-water sponge (*Alcyonella stagnorum*) is frequently to be met with floating in docks attached to logs of timber. It is very interesting to observe that these low organisms even seem to be attracted to each other, as it were in family groups. The *Alcyonellæ* live in groups of from ten to fifteen, and some sponges are so intimately connected as to be inseparable. Respecting their geographical distribution they are to be met with in all seas, and although they abound to a much greater extent in the tropics, even on the coast of Great Britain a great many species occur, nearly forty having been reckoned to belong to one genus alone.

RAMBLES IN FLORIDA.

BY R. E. C. STEARNS.

PART IV.

It was nearly noon of a delightful day in February when leaving the City of Tampa we crossed the Hillsborough River to the opposite bank for the purpose of visiting Rocky Point, which is situated upon *old* Tampa Bay; the route, for the greater part of the distance of seven miles, is through an

open forest of pines, of the species previously met with; the lack of undergrowth afforded pleasant and shaded vistas in every direction. In following the sandy road we waded through broad and shallow pools, miniature lakes made by the recent rains, in which we dipped our cans, and drinking found it more palatable than the water from the muddy springs we had just passed.

Upon both sides of, and a few rods from, the road are small deep ponds, covering perhaps an acre, surrounded with gaunt and leafless cypresses, *Taxodium distichum*, standing grim and naked in the midst of the forest; hoary, speechless giants, whose gnarled limbs seem to clutch at, while they sustain long drooping tufts of pendulous moss, that, in the sombre light, looked more like funeral emblems than living vegetation. Over these glassy lakelets the

> " * * * towering boughs of the cypress
> Met in a dusky arch, and trailing mosses in mid air
> Waved like banners that hang on the walls of ancient cathedrals.
> Death-like the silence seemed, and unbroken save by the herons,"

many specimens of various species of which were seen slowly marching with solemn strides, like veteran soldiers, guarding the solitude of the forest.

Seating ourselves upon a fallen pine we halted to rest awhile, for walking is warm work on such a day. There are no wild flowers, and in many places no grass, for a fire, which the last rain only partially extinguished, burned even the scanty sod.

Again we started, and moving forward had proceeded but a few rods when up flew a wild turkey (*Meleagris gallo-pavo* Linn.), the only specimen yet met with by us in Florida, and farther on, but out of range, a flock of quails, *Ortyx Virginianus*. This species is quite pretty; in fact all of the quails are tidy-looking birds, but the Californians,* with their plumed heads, rather lead the others.

* *O. pictus* Baird, and *Lophortyx Californicus* of Bonaparte, are common in the game season in the San Francisco markets, especially the latter species. They have, of late years, become more plentiful in California, though previously quite abundant. Their

The small hillocks of sand, of which we have seen at least a hundred since we left Tampa, are made by a species of Gopher (*Geomys pinetus* Raf.). The people call them Salamanders. The propriety of the name is not perceptible. Three or four species of *Geomys* are found in the Pacific States.*

We have arrived at the edge of the timber; the road no farther winds beneath the shade of the forest, but lies broadly open to a burning sun. It follows for a short distance through a sedgy marsh, with a rank growth upon either side and terminates at a cluster of cabins, which stand upon the sandy margin of the bay.

The small rudely thatched buildings, are occupied by a number of workmen engaged in the manufacture of salt. Their apparatus is of the simplest description. It consists of a few kettles, or evaporators, made by cutting in halves, longitudinally, the shells or outer cylinders of small steam boilers, which are rudely set in masonry of stone and mud. Into these kettles the salt water is pumped by hand from a well-hole, a large pit dug in the sand, into which the water seeps, or flows. The evaporation is produced by means of a fire under the kettles; the inflammable pitch-pine making an admirable fuel for this purpose. The thatched cabins† of the salt makers were quite a novelty to us. They are fifteen to

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increase is owing to two causes: the game-laws of the State protect them during the breeding season, and the extended settlement of the agricultural lands, leads to the extermination of those animals that prey upon them.

*The Gophers make sad havoc in the suburbs of San Francisco, by cutting off the roots of rare plants in the flower beds, or by gnawing through the cabbage roots in the market gardens. As they work underground, they are not easily detected, though mercilessly hunted upon some occasions by the gardeners, who frequently use a trap to catch them. The Gophers have a pouch in each cheek, in which they can carry food to their burrows.

In an article entitled "South-Western Slang," published in the "Overland Monthly," Vol. III, p. 129, the writer says, "On account of the great number of Gophers in that State, and the former use of their skins for money, a Floridian is called a "Gopher."

In California, a man who practices deception, or acts in an underhanded manner, is sometimes called a "gophering fellow."

†These palmetto structures resemble the thatched cabins of the natives upon the Isthmus of Darien, which are seen by the traveller while crossing from Aspinwall to Panama.

twenty feet square, and about six feet high at the eaves, and the roof is sharply pitched so as to shed the rain rapidly. The frame is made of small poles or saplings, upon which the leaves of the palmetto are tacked or tied, course after course, overlapped like shingles or weather-boards upon a common house. Sometimes a floor is laid and a board door hung to the frame. An excellent shelter for a warm climate is thus made, sufficiently close for protection against ordinary storms, a good screen from the sun, and open enough to admit of ventilation. Exceeding caution in the use of fire is requisite, and cooking must be done outside, and at some distance away.

We were kindly furnished with food and lodging by our host, an old Scotch sailor, with a bushy beard which rivalled the Spanish moss in color and in length:

"Like a wolf's was his shaggy head,
His teeth as large and white;
His beard of gray and russet blended;
On his hairy arm imprinted
Was an anchor, azure tinted."

After boxing around the globe for a quarter of a century he finally drifted into this out-of-the-way corner of the planet. With a palmetto cabin, plenty of oysters, game and fish, he lives a free and easy life, with few luxuries and fewer cares: his gun and dog, his boat and fishing gear, supply both food and recreation; like most sailors and sportsmen, he is a good cook; as to his knowledge of the culinary art, inquiry is best answered by the repeated sorties made by us upon the well cooked rations. "Actions speak louder than words."

From the salt works a trail leads across the sands, then through a bit of trampled marsh, over the sands again to shell-heaps large and small. There is only one of the heaps of sufficient size to be dignified by the name of mound; this latter covers an area of half an acre and is fifteen feet in height, at the highest point; it is composed entirely of shells; and the mound and heaps and ridges of shell, are,

perhaps, the remains of many feasts here enjoyed and celebrated by the tribe of which Hirrihigua * was chief. From a well-hole that was dug to the depth of eight feet in the principal heap, arrowheads of chalcedony, a sinker of "coral stone," and a spoon-shaped implement † made from a piece of a large conch-shell, *Busycon perversum*, were obtained. Fourteen species of shells were collected of which nine are the same as found at the Cedar Keys Mounds, and include the species that are living most abundantly at the present day, and which were generally sought for as food by the aborigines; the other five species ‡ are small shells, too small to be collected for the above purpose and were probably carried to the heaps, from their being attached to the shells of the edible mollusks. No fragments of pottery were detected, and nothing to indicate that the mound or any of the heaps were used for burial purposes; the ground outline of this series of heaps is quite irregular, and it appears rather to have been the result of accident than in conformity to any plan.

From the shell-heaps to the end of Rocky Point is at least a mile; the road or trail follows along the ridge, which consists of beach rubble and debris upon the top of an ancient coral reef; at many places as well as at the end of the point, the coral-rock crops out, and in some localities it is daily washed by the tide; at the water's edge are mangroves, and along the sides of the ridge are pines, palmettoes,§ and but-

*Irving's Conquest of Florida, Ed. 1869, p. 59.

†In the Ethnological department of the Smithsonian Institution may be seen (S. I. No. 5936) an implement from Chattanooga, Tennessee, collected by Mr. McRead, of the same form, and made of a piece of shell of apparently the same species.

‡One of these species, *Marginella conoidalis* Kiener, is quite numerous in Tampa Bay. I am inclined to believe that the so-called pearls that were seen by DeSoto and his men consisted in part of these shells; a bushel of the shells of this species in one pile was found at a depth of several feet below the surface, in the city of St. Louis, by Mr. T. T. Richards, specimens of which are in the collection of the Peabody Academy of Science. The locality was without doubt the site of an old Indian camping-ground or burial place.

§"This palm possesses a great, and to this country, an increasing value. It is the only tree produced in our forests which is not attacked by the *teredo navalis*, or ship worm, and as it is incorruptible in salt water, its value for submarine construction is almost incalculable; its leaves can be employed in the manufacture of hats, baskets,

tonwoods, and specimens of the Spanish bayonet (*Yucca*) trees frequently occur. Logs of the Pencil Cedar, that have drifted away from rafts, are lodged along the shore, or have been carried higher up by wind and tide; we turned many of them over and found numerous fine specimens of snails, *Helix volvoxis* and *Helicina orbiculata*, and a living scorpion. The spaces between the roots of the mangroves were filled with oysters which had also fastened to the roots, and a species of *Modiola*, closely resembling the common one, of the Atlantic coast, *M. plicatula*, but with somewhat finer sculpture, was abundant. The small oysters that are so common everywhere along the shore, growing near the high-water line, are not generally eaten except by the raccoons, hence the common name for them of "coon oysters." On the under side of detached lumps of these we found many rare little shells,* and several of the larger species of mollusks† especially the thorny conch, *Melongena corona*, may be seen prowling around, or half buried in the sand, at the edges of the oyster bars. The last named species is a famous oyster eater; but the law of compensation here intervenes, for the animal of the thorny conch is in turn eaten by many kinds of fish, for which it is an excellent bait, and it is therefore much used by the fishermen; the gulf trout also collect them on their own account, and it is quite common to find large shells of this species in their stomachs.

The position of the sun told us that it was time to return; the heat was excessive, and constant tramping and stooping had made us tired.

Cutting a bunch of palmetto leaves to use as a screen for our heads we struck a bee-line back to the shell-heaps; half

mats, and many other purposes of domestic economy, and the 'cabbage,' composed of the unexpanded embryo leaves may be classed among the delicious vegetables of our table; it is, however, a wasteful luxury as the tree always perishes when deprived of this part of its foliage." Elliott's Botany, vol. 1, p. 432.

*A new species of *Pedipes*, a tiny shell only eleven hundredths of an inch in length, was found at Rocky Point; it is described by me in the Proceedings of the Boston Society of Natural History, vol. xiii, as *P. naticoides*; it is the first of the genus found on the eastern side of this continent.

† *Fasciolaria distans*, *Busycon perversum*; the latter not numerous at this place.

way between the latter and the point, there is a narrow lagoon with dead mangroves standing along its edge; here we found the screw-shaped shell, *Cerithidea scalariformis*,* and the fine *Littorina angulifera*†, the latter on the mangroves high above the reach of the water; and on the grass, or slowly creeping on the surface of the wet sand, the coffee shell, *Melampus coffea*.‡ The Cerithidea is also found near the salt works, and *Littorina irrorata* can be gathered in quantities within a stone's throw of the buildings. On our way across the sand from the shell-heaps, an army of fiddler crabs hobbled aside, opening ranks to let us pass. After a hearty dinner we bade "ye ancient mariner" farewell, and making a straight wake, were at camp by dusk.

Remaining in Tampa for a few days awaiting the arrival of letters, and to complete our reconnoissance of the country in the immediate vicinity, we finally abandoned our headquarters, and bidding adieu to Camp Misery and its numberless fleas we placed our equipment on board of the schooner "Santa Maria, of St. Marks," a vessel of sixteen tons measurement, and cast loose from the wharf at Tampa at noon of a pleasant Monday in February, en route for Cedar Keys, to stop at such islands and points on the way as might be of interest. Proceeding down the bay we anchored near Ballast Point, and grappled up a goodly supply of oysters for the subsistence department, at the same time adding two

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*A much larger (allied) species, *Pyrazus palustris*, which occurs in great numbers in the salt marshes of the Eastern Archipelago, is collected, and the animal eaten by the natives, who roast them and suck the contents of the shell through an aperture made by breaking off the apex of the spire. Vide H. & A. Adams, Genera of Recent Mollusca, Vol. I, p. 291.

†A species of Littorina, *L. obesa*, is used as an ornament by the natives of the South Sea Islands, and the animal of another species (*Littorina litorea* Linn.) is extensively used for food by the poor in Great Britain; thousands of bushels are annually collected for this purpose.

‡A species of Melampus, *M. luteus*, is sometimes used to ornament the person by the natives of the Indo Pacific Islands, where this shell is found. In the Ethnological collection of the Museum of the Smithsonian Institution is a specimen (S. I. No. 3663) of a necklace from the King's Mill Islands, collected by the Exploring Expedition under Commodore Wilkes, which is made by weaving or winding eight rows of these shells around a central cord.

species of shells* to our collection, which were found adhering† to the oysters.

From Ballast Point a few hours sail in a light breeze brought us to Piney Point, or Point Pinalles, the latter being the common name with the people here. Off this point there is comparatively deep water and a fair harbor; this place is believed by many to have been the anchorage ground of DeSoto's‡ fleet, three hundred and thirty years ago.

The historian says: "His squadron consisted of eight large vessels, a caravel and two brigantines, all freighted with ample means of conquest and colonization;§ besides the ship's crew his force numbered one thousand men with three hundred and fifty horses."

The fleet arrived at the mouth of Tampa Bay on Whitsunday, the twenty-fifth day of May, 1539; three hundred of his men disembarked on the following Saturday, and the remainder of the force landed on the succeeding day.

To the bay, De Soto gave the name of Espiritu Santo; the first detachment met with a rough reception, for on the morning after it landed the savages broke upon the Spaniards who were carelessly lying around, and with deafening yells drove them in confusion to the water's edge; the latter were speedily reinforced from the vessels and soon dispersed their foes.

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* *Mytilus hamatus* Say, and *Odostomia impressa* Say.

† Memorandum for young collectors; always examine critically the outside of large or roughly sculptured shells, for by so doing many rare and valuable acquisitions are sometimes made; many of the smaller species can be obtained in no other way.

‡ After the failure of the Expedition of Pamphilo de Narvaer, Fernando de Soto next attempted to occupy the country, having sold his claims on the Peruvian Conquest in which he performed a prominent part, for an immense sum of money. This last expedition was undertaken by De Soto at his own expense. Landing on the shore of Tampa Bay with one thousand men, and assisted by Ortez, a survivor of the Narvaez Expedition, who was a favorite with a chief in the interior, he proceeded for some distance without serious opposition, treating the natives generally with kindness. He pursued his way through Florida, though bravely and powerfully resisted; after leaving what is now known as Florida, he met with and repulsed several bands of hostile Indians, and was ambushed by a numerous body which he defeated in a desperate conflict; led on by the hope of finding gold, he and the remnants of his army crossed the Cumberland Mountains and the Mississippi River, and it is supposed that he was in the neighborhood of the Red River in Arkansas, when, in the spring of the year 1542, he died of fever at the age of forty-two years.

§ Irving's Conquest of Florida, Ed. 1869, p, 56.

At Piney Point are numerous shell-heaps and mounds; they are covered with a dense vegetation; climbing over prostrate trees, or crawling upon hands and knees, through a tangled growth of vines and shrubs, we forced our way as best we could, from mound to mound, over ground rich with historic interest and upon a spot which had received the foot-prints of as brave and adventurous a band of men as have ever walked the earth. "If at times our feelings revolt at the outrages committed by them upon the poor Indians, and by their wrongs towards those native chieftains who fought and fell so heroically in the defence of their homes, yet our indignation passes away and is forgotten in the melancholy fate of the invaders. Scarce three years had elapsed from the time of their embarkation at Cuba, when nearly the whole train of youthful cavaliers had passed away; horse and rider alike had perished, and their bones lay bleaching midst the savage wilds of America!"*

The mounds are crowned with magnificent specimens of the palmetto; in the vicinity may be seen the *Cerasus Caroliniana* or Wild Orange; also sycamores and pines. Various flowering shrubs and vines not in bloom at the time of our visit compose a part of the undergrowth. We were unable to obtain a sufficiently extended view by which we could form an idea of the relation of heap to heap or mound to mound, or ascertain whether any general plan had been pursued in their construction; the Floridians, residents of the neighborhood, believe them to be defensive works that were erected by De Soto; but we could perceive no basis for this belief, as the structures separately viewed are essentially the same as others we had examined.†

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*Irving's Conquest of Florida, Ed. 1839, p. 447.

†In none of the mounds examined by us were found any ornaments for personal adornment made of shells. From mounds in other places in the Southern States articles for that purpose have been obtained. In the Smithsonian Institution, No. 1627 of the Ethnological specimens, is a pendant for a necklace or ear-drop made of a piece of a species of Busycon which was found in a mound in Texas; also in the same collection, No. 5311, is a roughly polished valve of *Unio gibbosus?* perforated, found near Sulphur Spring in the neighborhood of Nashville, Tennessee; No. 7654, also Smithsonian Col-

The account of the landing and movements of De Soto thereafter does not show that he remained at or near the place of debarkation, save but for a short time, for the purpose of giving his men a few days rest after the confinement of shipboard. If he had made this a base or point of support for subsequent operations it is probable that he would have caused earthworks to have been erected, but otherwise it would have been unnecessary and useless labor; as above stated there is nothing in the character of the mounds and heaps that show any difference from similar structures elsewhere met with by us.

This locality was undoubtedly the site of a populous Indian town; the ground in the neighborhood is rather above the average height, and the position such as to make it particularly healthful in the summer and autumn. The waters abound with fish at certain seasons, and the neighboring islands furnish abundance of oysters and other mollusks that were apparently considered edible by the Indians. Near this place, and inside of the keys, we gathered for our use as food, quantities of Quahaugs (*Mercenaria Mortonii* Conrad), of mammoth size and excellent quality; a pair of the empty valves sometimes weighing between three and four pounds! At low tide can be collected the reversed Conch (*Busycon perversum*) and the Horse Conch (*Fasciolaria gigantea*), of which it is supposed the Indians made their war-trumpets.* Here also abound not only many smaller molluscous animals of sufficient size to be important for food, but the Thorny Conch (*Melongena corona*) elsewhere alluded to. The bleached shells of the species named are

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lections, is a convex disc of shell (species unknown) from a mound in Union County, Kentucky; this last was collected by my friend, Major S. S. Lyon, of Jeffersonville, Indiana.

*Another large shell, the beautiful *Triton variegatum*, is used as a war-conch by the natives of many of the Indo Pacific Islands. See specimens in the Ethnological collection of the Smithsonian Institution (3825) from Carlshoff Island; (3466) Samoa Island, and (2907-8) Fejee Islands (called by the natives n-d-a-v u-i). These specimens are a part of the material collected by the U. S. Exploring Expedition under Commodore Wilkes.

found in all of the Kjœkkenmœddings on the western coast of Florida, as far as we explored.

On some of the smaller islands the pelicans, gulls, and other maritime birds deposit their eggs, and on the larger keys raccoons and deer are abundant. The occasional visit of a Puma (*Felis concolor*) sometimes arouses the slumberous quietude of the isolated settlements; a quietude at the present day undisturbed by the war-whoop of the savage, and seldom broken except by the music of the mocking-birds, or the noisy screeching of the parrots (*Conurus Carolinensis* Kuhl). The great requisite for the sustentation of large numbers of barbarous people exist here now as they did centuries ago. Along the base of a ridge of shells, which is situated so near the edge of the bay as sometimes to be washed by its waves, we picked up several arrowheads and small fragments of pottery. About half a mile below a new settler had just planted his stakes and was building a cabin, his nearest neighbor resides two miles above. Driven from his native state by the rude and chilling breath of the north wind, and suffering from pulmonary troubles, he here seeks and will measurably find what Ponce de Leon sought, the "fountain of health," provided he does not succumb to the fever and ague, of which there is a chance. Near his new home there is a creek where alligators (*A. Mississippiensis* Gray) watch with jealous eyes the invasion of their domain. As the presence of the huge reptiles frightened the children when they went to the creek for water, one of our party proceeded to the spot and slaughtered a saurian some ten feet in length. We were told of cases where pulmonary patients "with one foot in the grave" and one hand upon the door knob, evaded eternity, at least for a term, by eating alligator meat; and alligator oil we were assured is a specific against pulmonary consumption. If the oil of the alligator has any connection with its power of extending the jaws, we have no doubt a moderate dose might enable the most despondent invalid to grin. Of one fact we are cer-

tain, they have no *ear* for music. A young living specimen, two feet long from snout to tip of tail, upon which we expended sundry vocal performances of a high order, manifested not the slightest appreciation, and we were never encored. Chagrined at the apathy of the audience we deliberately insulted it by reciting aloud, and in the most sarcastic manner, the following verse:

"How cheerfully he seems to grin,
How neatly spreads his claws,
And welcomes little fishes in,
With gently smiling jaws."

But the voracious beasts not only "welcome little fishes in," but frequently attack dogs and pigs, and instances are known of their attacking children and men.

We remained within two or three miles of the mound anchorage for several days collecting along the shore, or in the lagoons and marshes. Provided with well greased long boots we waded for miles, and at low tide could have crossed from the main land to the opposite keys, so shallow is the water, had not a narrow but not deep channel prevented. Sometimes at night we slept by our camp fires ashore, or, according to the caprice of the moment, on board of the schooner, during the twilight spinning yarns or relating adventures in other places, or listening to the serenade of the drum-fishes swimming alongside, until sleep, "the giver of sweet visions, came."

From Point Pinalles it is but a short sail to Long Key. Upon the easterly side of the latter we found many specimens of *Fasciolaria tulipa* and *F. distans*, but much handsomer shells of these species may be obtained upon the outer shore of the key; those from the inside are covered with a confervoid growth that is somewhat difficult to remove, and when clean the shells retain a green stain. The southerly end of this island is the best collecting ground; the beautiful Winged Conch (*Strombus alatus* Gmel.), the great Cockle (*Cardium magnum* Bom.), the heart-shaped Cockle (*Cardium isocardia* Linn.), a curious thorny Oyster

(*Chama arcinella* Lam.), and the fine bivalves *Callista gigantea* and *C. maculata*, and many other molluscan forms of interest and beauty are quite numerous. The water deepens rapidly upon the outside of the key, and many species may be found upon the outer beaches that are rarely met with on the shore of the main land. While walking near the edge of the water the surf rolled up a fine living specimen of the odd-looking trigonal Trunk-fish (*Lactophrys camelinus* DeKay), sometimes called Cow-fish, a profile view of the head much resembling that of a cow; and along the drift rows a few specimens of a Sea-cucumber (*Holothuria*), which look like an empty bead purse. There is a large species found in Puget Sound that is eaten by the Indians, and the *Holothuria edulis* is regularly collected by the Malays in great quantities, dried, and sold to the Chinese who regard it as a delicacy. We prefer broiled quails. Specimens of the switch-like Gorgonia (*Leptogorgia virgulata* M.-Edw.) are mixed in with the drift; and attached to the bases of many of the specimens is the queer Ark-shell (*Arca Noæ* Linn.), called Noah's Ark; here also are large sponges, shaped somewhat like a vase. The business of sponge collecting is quite profitable. At the present time there is an increased demand for the coarser species, as, after proper preparation, it makes a most excellent filling for pillows and mattresses. The sponges furnish numerous microscopic forms of wonderful beauty, and fossil sponges are found in many of the geological strata in Great Britain.*

Having added largely to our collection during our pleasant stay upon Long Key we again got under way, and early in the afternoon of a mild winter day we came to anchor in the pass at the end of Pine or Piney Key, and soon after went ashore. This little island is one of the most delightful spots on earth; it is covered with vegetation almost to

*While the green sand, the upper chalk, and the Kentish rag were forming, corals and sponges grew in every sea . . . . . The Brighton pebbles and the Wiltshire flints are principally petrified sponges . . . . . (Milton's "Stream of Life.")

the water's edge. It is encircled by an outer growth of mangroves. Pressing through these, and crossing to the opposite side of the key, we passed through successive zones of palmettoes, buttonwoods, etc., and intervals, where the rank grass is from three to four feet high; in one of these we made a camp, and all hands went vigorously at work cutting and hauling the boughs of dead fallen trees for our night fire. Quite near to the camp is a narrow bayou, which indents the shore so as to resemble a huge drumstick with the knob or head inland. At low tide this knob or head is separated from the other portion, or handle, by an oyster bar, from which we obtained a great quantity of delicious oysters of large size; here also we found many other species of mollusca, some of which are quite rare, including a beautiful cone-shell. The sandy part of the oyster bar, as well as the narrow beach, was closely dented with the hoof-prints of deer, and the footprints of "coons." In many places sturdy thistles, and cacti of large size, furnish a hiding-place for the snails, *Helix cereolus* and *H. uvulifera*, and the dense undergrowth a nesting-place for the birds. As the sun had sank so far below the tree tops as to shade our camping-ground we started our evening fire. Tramping and the salt sea-air gave a keenness to the appetite that caused the supper of stewed and roasted oysters to disappear in a marvellous short time. Having finished our repast we filled our pipes and from time to time piled fresh fuel on the fire and watched the flashing flames.

It was a brilliant night, serene and cloudless, and the moon was near the full. The buttonwoods and palmettoes glistened in the silver light which descended from above, and were tinged by the ruddy glow of our huge camp-fire which lighted them from below, making each tree in the foreground distinct in vivid lines of beauty; the dark recesses of the denser growth occasionally illuminated by a flame which streamed up for a moment and disclosed colonnades of pines and palms, standing equidistant and regular

as if placed by human hands. It required no flight of the imagination to transform these charming forest vistas into the long, dim, aisles of cathedrals; the trunks of the trees forming the pillars, and the graceful leaves of the palmetto, overarched, forming a roof.

"The groves were God's first temples."

We sat up late, enjoying the glories of the night, the last of our out-door camping in Florida. Early the following morning we "broke camp" and prepared for the return trip to Cedar Keys. Hoisting the anchor with a cheerful "heave yo," the sails of the Santa Maria soon filled, and we were homeward bound. We gave a farewell look by way of a parting salute to Piney Key, as it stood out bright and beautiful in the purple light of the morning:

The slanting sun shone white along the sand,
Strewn with green sea-weeds and with crimson shells,
Out of the ocean's dim mysterious cells,
Jewelling all the broadskirts of the land.

Arriving at Cedar Keys after a pleasant voyage, we proceeded homeward over the same route by which we came.

The winter climate of Florida is not only healthful but delightful; in the summer there is danger of contracting fever and ague, and the yellow fever is an occasional visitor. The climatic advantages to the invalid are at the present time counterbalanced by the miserable food and discomforts of the hotels and boarding houses; there are undoubtedly exceptions to the last objection, but they are rare. The expenses of a three months trip are quite heavy and we could make a journey to Europe or California, of the same duration for the same cost, and live infinitely better in bed and board.

In an agricultural point of view Florida offers no inducements to the emigrant or settler that are not surpassed by many other sections of the country, whether quality of soil, facilities of transportation, accessibility to markets, or variety or capabilities of production are considered. An emi-

gration of enterprising and industrious people, in sufficient numbers so as to exercise a controlling influence, would in a few years effect a great change for the better, and place the State in the line of progress. The average Floridian of to-day understands only one thing, and that is "how *not* to do it." Emigration should be by colonies, and should include some mechanics, and be well provided with all necessary agricultural and mechanical implements and material, in order to be successful, and great care should be exercised in the selection of a location.

The trip to Florida, of which these "Rambles" afford a mere outline, was not devoid of scientific interest, and the results will be made known at some future time, either in the NATURALIST or some other appropriate publication.

THE NATURALIST IN CALIFORNIA.

BY J. G. COOPER, M. D.

NO. II.

The Colorado Valley in winter.—I arrived at Fort Mojave, after a journey of sixteen days from Los Angeles,* on December 19th, 1860. This post is situated close to latitude 35°, where the boundary line of California strikes the river, and although on the Arizonian side, has, probably, no species of animals not also living on the west bank of the river, unless *Lepus callotis* be an exception. This, the Texan hare, I found common there, while *L. Californicus* is the prevalent, if not the only large species westward. The valley of the Colorado at this post is, probably, ten miles in width, and formed of a succession of gravelly terraces, or *mésas*, with a narrow sandy bottom intervening,

*Not Angelos, as printed before. Spanish, not Italian.

not over a mile wide. The whole upland has a most barren and desolate aspect, the only vegetation being low shrubs of the fetid *Larrea Mexicana*, with cacti and other thorny plants beneath. The bottom land, however, supports a vigorous growth of cottonwood, willows, and mesquite, a name applied there to two quite different trees, the *Algarobia glandulosa* and *Strombocarpa pubescens*. Dense shrubbery and coarse grasses cover most of the ground, even under the darkest shade, though spots are sometimes too alkaline for any vegetation except a few sea-shore plants, and in places the winds keep up a rolling waste of sand hills. The river itself is so low in winter that the Indians can wade across with their heads above water, and is so muddy as to fully deserve its name.

After my desert experience, I gazed with delight on the broad flashing stream, with its forest-clad banks, even though the trees were then bare, and the whole country nearly of the same brown tint as the river, for I knew that the very barrenness of the surrounding regions must drive most of the animal life to the river banks, one class in search of vegetable food the other to prey upon the former, while such as loved water must necessarily seek it here. And, with the exceptions mentioned as desert animals in my former article, nearly all of the higher animals are confined to this narrow belt of timber, stretching along the course of the Colorado from its Great Cañon, thirty miles higher up, down to its mouth. Those living permanently on the uplands must depend on a very scanty supply of dew for water during most of the year.

I must remark here that in climate this region belongs to Mexico, the winter being the *dry* season, and the summer subject to violent thunder storms from the south, but not *wet*, the whole annual rain not exceeding three or four inches, of which perhaps *one* falls in winter. The temperature rarely falls below the freezing point in latitude 35°, although the surrounding mountains were white with snow

on several occasions during January. The elevation of the river at this point is not over 550 feet, and the whole bottom land is inundated nearly every summer. The distance by the course of the river from its mouth is 400 miles.

The fauna of the valley naturally partakes much of the Mexican (west slope) character, and has some peculiarities. It is too limited and too liable to inundation for many land mammalia to flourish in it, except such as are common to the neighboring deserts and mountains. A second species, at present known no farther west, is the Leaf-nosed Bat (*Macrotus Californicus*) from Fort Yuma. This bat, like the birds, is independent of floods, and is probably migratory southward in winter, like two species I obtained at Fort Mojave—the Pale Bat (*Antrozous pallidus*), and a small species of *Vespertilio* which did not appear until March 15th, though the climate was warm enough for weeks before.

On walking out with my gun I was struck with surprise at the great numbers of Abert's Finch (*Pipilo Abertii*) frequenting the grove, the flocks flitting before me like dry leaves before the wind, their color exactly resembling the prevailing hue of the foliage covering the ground, and now densely coated with brown dust. It recalled the observation I had often made as to the prevalence of this brown hue in so many birds of California, of different genera and families, but agreeing in their habit of living in low shrubbery which has the same brown and dusty tint for eight or nine months of the year. The loud call or alarm note of this bird was strikingly different from the notes of its more silent cousin near the coast, the *P. fuscus* (or *crissalis*), but I soon noticed another strange fact, namely, that this note was also uttered by two other very distinct birds of dissimilar habits, the Shining Flycatcher and Gila Woodpecker (*Centurus uropygidlis*), both of which were abundant and feeding together on the berries of the mistletoe, parasitic on almost every tree. These birds were my first specimens, together with the common Grass Finch (*Poœcetes grami-*

neus) and Chipping Sparrow (*Spizella socialis*), which were wintering there in small flocks.

Next day I was disgusted to find my specimens damaged by mice, and, on setting a trap, soon secured some which I cannot distinguish, except by a lighter hue, from the common woodmouse of California (*Hesperomys Gambellii*). These, with several other rodents, had taken up their residence in the thatched roofs of our *adobé* quarters. On Christmas eve a little ice formed in the valley, but next morning the Brown Thrush (*Harporhynchus crissalis*) of this region was singing melodiously, and exactly in the style of its cousins east and west, so well known as "False Mocking Birds." It is another of the dead leaf-colored birds of the western regions, and is as strictly limited to the groves as its pale sandy-hued relative, *H. Lecontei*, is to the desert shrubbery.*

The end of the year was cold and stormy for this latitude, so that no additions, except more northern migrants, were obtained among the birds, the most notable being the Oregon Snowbird (*Junco Oregonus*), and a few of the Meadow Lark (*Sturnella neglecta*), with several species of ducks and geese. In January, Swans (*Cygnus Americanus*) also appeared for a few days. On Jan. 10th I was both surprised and pleased to obtain a beautiful specimen of the Bohemian Waxwing (*Ampelis garrulus*), which had wandered so far from the mountains north-eastward, where the species abounds, and, probably driven by storms, had sought a temporary refuge in this far southern latitude. It was a solitary straggler, and even its cousin, *A. cedrorum*, never appeared there during my residence.

On the 16th a solitary Mexican Flycatcher (*Myiarchus Mexicanus*), evidently almost starved, gave a specimen of the summer group of migrants lingering in the valley

*I may here correct an error caused by the transposition of a line in my last article. "Corresponding in color to the rocks among which it lives," was intended for Harris's Squirrel, though it *would* apply pretty well to the Sage Fowl under which it is printed.

through the winter. Vegetation was just commencing to bud forth now, and I observed a few Doves and Cow-birds (*Molothrus pecoris*), apparently attracted by the opening spring, as none appeared before. I cannot enumerate all the species of vertebrates which now amounted to over fifty, as I collected them, but must notice only the more remarkable. The resident species not found westward of this valley were the Ladder Woodpecker (*Picus scalaris*), the White-bellied Wren (*Thriothorus leucogaster*), Gambel's Quail (*Lophortyx Gambellii*), the Arizona Song-sparrow (*Melospiza fallax*), the lead-colored Gnatcatcher (*Polioptila plumbea*), Malherbe's Flicker (*Colaptes chrysoides*), and the Yellow-headed Titmouse (*Auriparus flaviceps*). Besides these, most of the species before mentioned are resident, and also many common to the coast regions. Frosty nights throughout January seemed to prevent the appearance of any new birds. Even in February the new comers were only such as I know winter in more northern parts of California near the coast, though the thermometer rose to 80° on the 20th.

February 27th, a few Bank Swallows (*Cotyle riparia*, or *serripennis**) and bicolored Swallows (*Hirundo bicolor*) appeared. Even these last winter near the coast much farther north, to latitude 37°. It appears that there is little migration along this valley of the species common in summer near the coast, as they have to cross the deserts, and prefer a more western route. Some of the *winter* residents however became more scarce, probably seeking the mountains or high lands not more than a hundred miles distant, while the strong-winged hawks and swimmers may have gone even to the arctic regions.

Spring.—By March 2d, the poplars ("cottonwood") were in nearly full leaf, and beautiful flowers covered the richer

*Dr. Kennerley found this species here "abundant," February 21st, 1854. Also, the White-throated Swift (*Panyptila melanoleuca*), at William's Fork, February 16th, and Western Whippoorwill (*Autrostomus Nuttallii*), February 23d.

and warmer spots, chiefly in the ravines of the neighboring mountains. A duck was seen by an old resident on the river, which he said was very rare there, and from description was probably the long-legged Tree-duck (*Dendrocygna fulva*), since found to frequent the Sacramento Valley for nine months of the year, and to breed there; one of the few peculiarly western species. I shot or observed many other species of aquatic birds while here, but they furnished no very interesting facts. I obtained one each of the Red-necked and Williamson's Woodpeckers (*Sphyrapicus nuchalis* and *Williamsonii*), the only ones seen, and probably stragglers from the north.

I had been ten weeks at the post before I saw a single Burrowing Owl (*Athene cunicularia*), and then found only one pair, several miles distant, inhabiting a burrow evidently freshly dug by themselves. In the absence of the large burrowing squirrels, or other animals of similar size, they are sometimes compelled to burrow, but do not seem to increase in numbers in such localities. The general hardness of the soil on the upland is also an obstacle to their digging.

On March 10th I observed the first Hummingbird (probably *Atthis costæ*, which Dr. Kennerley found in February 1854, in the warmer valley of William's Fork), and the same day saw large flocks of geese migrating north. The first Rattlesnake (*Crotalus atrox*) was killed this day, and I obtained the first Horned Lizard (*Doliosaurus platyrhinos*). The weather now being very warm, flocks of cranes, swallows, and various winter residents were seen going northward daily. On the 15th I saw the first Bat and Western Whippoorwill, and on the 19th shot another Mexican Fly-catcher, probably also a winter resident. There is evidently a constant moving northward of the winter residents, but apparently none from Mexico.

On March 22d I obtained the first seen of the Pale Sparrow (*Spizella pallida**), which seems to go farther south to

*Decidedly this and not *S. Brewerii*, which Coues supposes to replace it in Arizona and westwards.

winter than the *S. socialis*, but the first birds which I could consider as probably the leaders of the summer migration, were, as it happened, of a new species, viz., *Helminthophaga Luciæ*, or Lucy's Warbler, which I shot at first sight on March 29th, the two first being males, and attracting my notice by their notes, as their small size and concealment in the dense mesquite thickets, which were just leafing out, would have otherwise prevented their discovery for a long time. They may even be winter residents in the valley like the allied *H. celata*.

The first nest I found with eggs was that of a Shrike (*Lanius excubitoroides*) on the 19th, and on the 26th obtained the first eggs of the Quail, of the Yellow-headed Titmouse (which builds an extraordinary closed nest of thorny twigs, like the magpies's in miniature), and of Abert's Pipilo.

Burrows were not uncommon which may have been made by Foxes or by the Badger (*Taxidea Americana*). On March 30th, visiting a steel trap which I had set for burrowing animals I was surprised to find in it a Swift Fox (*Vulpes velox*) caught by the toes. Having no way of securing it alive, I was obliged to make a dead specimen of it at once, fearing it might tear itself away. This is one of the mammalia which has not yet been detected west of the Colorado, though it undoubtedly exists there, and is indeed but a dwarf variety of the common Red Fox. Other mammals which I had obtained were Gambel's Woodmouse, before mentioned; Audubon's Hare (fur finer than near the coast, approaching *Lepus artemisiæ*), Coyoté (*Canis latrans*), killed by the dogs while running through the camp one moonlight night in January; Brush-tailed Rat (*Perognathus penicillatus*), quite common in the thatched roofs; Dark Woodmouse (*Hesperomys austerus?*), before found only in Washington Territory, but undistinguishable by descriptions; Boyle's Woodmouse, probably a mere long-tailed variety of Gambel's; the Mexican Woodrat (*Neotoma Mex-*

icana), common and very large; Phillip's Jumping-rat (*Dipodomys Phillippii*), common, and an invader of dwellings. The Texan Hare I have already mentioned. The Indians also brought in a fawn, apparently of the *Cervus Columbianus*, which seems to be the common species along the river, although others probably exist. They also brought a young antelope, of which herds were seen on the neighboring mésas during the short period of green vegetation in spring. A Wild-cat (*Lynx rufus*) was often seen at dusk about the post garden, where I attempted to shoot it but failed for want of light. My inquiries about the Californian Opossum found along the Mexican boundary, did not indicate its existence in this valley, though it will be found there if anywhere in California, nor did I learn of any other carnivorous mammals. Beavers are quite common in the river and grow to an enormous size; Gophers (*Thomomys fulvus*) are also common.

Compared with Kennerley's collections, in 1854, and Coues', in 1865, at Fort Whipple, the first quarter of 1861 must have been unusually cold. April proved to be the month for the arrival of the great body of summer birds, although a week before I saw what I took to be a Fork-tailed Flycatcher (*Milvulus forficatus?*), a species never yet obtained west of the Rocky Mountains, and a Scarlet Flycatcher (*Pyrocephalus Mexicanus*), which is a rare summer visitor, about which I could not be mistaken, though neither would allow of a near approach. I obtained the following, usually as soon as observed: April 2d, *Atthis costæ;* 3d, Bullock's Oriole (*Icterus Bullockii*); and saw an *Empidonax*, Barn Swallows, and Summer Yellow-bird; a ground Cuckoo (*Geococcyx Californianus*) laid an egg in its cage. 11th, shot an Obscure Flycatcher (*Empidonax obscurus*). 17th, Texan Nighthawk (*Chordeiles Texensis*), and saw the first eggs of Orioles. 24th, McGillivray's Warbler (*Geothlypis McGillivrayi*), Yellow-breasted Chat (*Icteria viridis*, not long-tailed), Arkansas Kingbird (*Tyrannus verticalis*).

25th, found the eggs of Common Doves. 26th, shot a new species of Owl (*Micrathene Whitneyi*) in a dark thicket. 28th, Summer Red-bird (*Pyranga æstiva*). 29th, found a nest and two eggs of the Shining Flycatcher. In this month I saw an unknown species of Oriole in the high trees, like *Icterus Parisorum* Bonap.

On April 6th I trapped a squirrel, of a species which I had not before observed, a third larger than Harris', and dark-brown instead of gray, but with proportions and markings so exactly like the desert species, that, remembering the varieties of the Four-striped Tamias, I did not dare to consider this distinct. It was all I saw of the kind, which may be common in the wooded mountains of Arizona. On the 13th I obtained the first Pale Bat, before noted.

Reptiles had now become common in the valley, and were mostly distinct species from those of the deserts. Besides those mentioned, a large Fence Lizard (*Sceloporus magister?*), eight inches long, began to frequent the trees March 20th, and on the 23d, three young of my new Land Tortoise (*Xerobates Agassizii*) were brought from the mountains by Indians. The Thirsty Lizard (*Dipsosaurus dorsalis*) became common in the ravines near by, far from water. On the 30th I caught Graham's Salvadora (*S. Grahamii*), a pretty harmless snake living in the grassy valley. April 15th, Woodhouse's Toad* first appeared on the drier banks; 17th, Churchill's Bull-snake (*Pituophis bellona*); 26th, Boyle's Milk-snake (*Lampropeltis Boylii*); 29th, the Coppery Whip-snake (*Masticophis testaceus*), and some very swift lizards (*Crotaphytus* sp.) which I did not succeed in catching, appeared on the desert plains.

On May 1st I shot the Little Flycatcher (*Empidonax pusillus*), which I then mistook for *E. Traillii*, but find by my notes that this one differed from a true specimen of the latter, shot on May 20th, in having the lower mandible brownish instead of yellowish and in proportions. It was lost, with

*Dr. Kennerley found toads at William's Fork, February 18th, 1854.

a valuable collection sent by the "Golden Gate," on the way to Washington, but I happened to reserve the other one, about the occurrence of which west of the Rocky Mountains there has been some discussion.*

May 6th, shot the first Blue Grosbeak (*Guiraca cærulea*); 14th, the Blue-headed Greenlet (*Vireo solitarius*†), which Dr. Coues omits from the birds of Arizona, supposing it to be his *V. plumbeus*, which however is quite distinct, and one I did not obtain.‡

May 19th I found a nest of the Yellow-breasted Chat containing three eggs, besides one of the parasitic Cow-bird; on the 8th a nest of the House Finch, or Red Linnet (*Carpodacus frontalis*), with eggs, and on the 19th that of the Song Sparrow (*Melospiza fallax*).§ May 20th I first saw the Blue Linnet (*Cyanospiza amœna*), and shot Hammond's and Traill's Flycatchers (*Empidonax Hammondii* and *E.*

*See Coues' List of Birds of Fort Whipple, Arizona, in "Proceedings of the Philadelphia Academy of Natural Science," January, 1866. Compare also Coues, in "Ibis," April, 1865, and July, 1866; Baird on Distribution of Birds, in "Silliman's Journal," and my article on Additions to the Fauna of California, in the "Proceedings of the California Academy of Sciences," IV, iii, November, 1868.

†Length 4.87; extent 9; wing 3 inches; bill black; lower mandible bluish; feet lead color; iris brown; male.

‡I take this occasion to notice the prevalence of lead-gray among the arboreal birds of these arid regions, just as brown prevails among the more terrestrial. It replaces the brown, olive or greenish, in many species also found in moister and more wooded regions, while others, differing in other respects from their eastern representatives, are considered as distinct species peculiar to these regions. The Pigeon Hawk (*Falco columbarius*), Mottled Owl (*Scops asio* var. *McCallii*), Night Hawk (*Chordeiles popetue* var. *Henryi*), *Icteria viridis* var. *longicauda*, *Thriothorus* (*Bewickii* var.?) *leucogaster*, *Poœcetes* (*gramineus* var.?) *confinis*, *Melospiza* (*melodia* var.?) *fallax*, *Sturnella* (*magna* var.?) *neglecta*, and Ground Dove (*Chamæpelia passerina* var. *pallescens*), furnish examples of more or less marked differences in this respect from those of other regions. The gray species as usually recognized, are the Hare Hawk (*Falco polyogrus*), Squirrel Hawk (*Archibuteo ferrugineus*), *Micrathene Whitneyi*, Nuttall's Whippoorwill (*Antrostomus Nuttallii*), Western Kingbirds (*Tyrannus vociferans* and *verticalis*), Say's Pewee (*Sayornis Sayus*), *Empidonax obscurus*, *Polioptila plumbea*, Grace's Warbler (*Dendrœca Gracie* Coues) of Fort Whipple, *Helminthophaga Luciæ*, Swainson's Vireo (*V. Swainsoni*), Lead-colored Vireo (*V. plumbeus*), Coues' Vireo (*V. vicinior*); these last three from Fort Whipple; Little Vireo (*V. pusillus*), Lead-colored Titmouse (*Psaltriparus plumbeus*), Lawrence's Goldfinch (*Chrysomitris Lawrencii*), Pale Snowbird (*Junco caniceps*), all of which have darker-colored representatives either east of the Mississippi, or on the west coast, or both, while some of them extend their range to one or both of those natural boundaries.

§The nesting, as well as the arrival of many birds, was from one to two months later than at San Diego in 1862.

Traillii); also, Richardson's Pewee (*Contopus Richardsonii*) and Black-cap Warbler (*Myiodioctes pusillus*).* The only mammals I obtained were a small Bat (*Vespertilio Yumanensis?*), and the typical gray variety of Harris' Spermophile, shot some miles from the river on May 28th, the day I started to return to the coast. The reptiles added were the Colorado Toad (*Bufo alvarius*), an enormous semiaquatic species nearly as smooth as a frog; and several others on the way westward which do not appear to inhabit the valley.

Fish seemed to be scarce in this muddy river, and I only obtained three species of cyprinoids: a large one called Colorado Salmon (*Ptychocheilus lucius*), a Gila (*G. robusta?*), and one allied to the Suckers (*Catostomus*). Mollusca were equally rare, and a few specimens of the remarkable *Physa humerosa* and *Planorbis ammon* were all I found. My collection of vertebrata made at Fort Mojave numbered 100 species, and 250 specimens.

I might enumerate many other species that have been obtained in the Colorado Valley by other collectors, but it would be too long a list. I have, altogether, counted up twenty-three species of mammals, one hundred and nineteen birds, and ten reptiles, as found there at various seasons, some of which I heard of as visiting Fort Mojave later than my stay there. By May 15th the spring rains were over and the short vegetation of the mésas was drying up. About this time also the river was rising rapidly, bringing down cold water from the mountains, and moderating the heat which had been as high as 116° in the shade on April 20th. The summer wind began to blow from the *south*, and would, probably, bring some of the latest birds with it, while others would come after the floods to seek the food left by the subsiding waters. Among these have been seen the strange Vulture-eagles (*Polyborus Audubonii* and

*On the 27th I saw the only one of the rare Western Warbler (*Dendræca peridentalis*), and the first Sea-green Swallows.

Craxirex unicinctus), the little Ground Dove, and the quaint Wood Ibis, called there "Colorado Turkey" (*Tantalus loculator*).

My object has been to give merely a sketch of the progress of the faunal seasons, as I saw them.

HINTS ON TAXIDERMY.

BY C. A. WALKER.

[Concluded from page 201.]

The method of skinning and mounting tortoises and turtles.—By examining the exterior covering of this order it will be seen that it consists of two horny plates or shields, which are closely united at the sides, forming a protection to the soft parts of the body; the upper one is called the carapace, and the lower one the sternum or breast bone. Before commencing the operation of skinning it is necessary to separate these two plates by means of a strong knife, chisel, or other similar instrument, or a fine saw, taking great care to make the separation at the suture, as far as possible, and to avoid cracking the shell. After this operation has been finished remove all the flesh adhering to both the upper and under plates. The arrangement of the bones and muscles differs so essentially from that of the other orders of vertebrates that attention should be given to this point in removing the various parts. The fore and hind legs should be turned out, and all the flesh adhering to them removed, taking care not to separate these various parts from their attachments to the upper shell; also, the neck and head should undergo the same operation, the brain and eyes being removed. The inner surface should now be thoroughly cleaned by means of a stiff brush, and the preservative applied to every part, after which they may be restored to

position, having previously filled the eye sockets and cavity of the brain with cotton. In stuffing, commence by restoring the neck to its natural form with cut tow. A wire (the body support), well pointed, should next be inserted at the top of the head, upon the outer surface, and passed down through the cut tow within the neck, across the space previously occupied by the body, and thence through the tail until it protrudes at the tip of the same. The other wires, or leg supports, should be inserted at the soles of each foot, up within the skin of the legs, and secured firmly to the main body support. The adjustment of the wires is essentially the same as recommended in the mounting of the larger mammalia. The various muscles should now be imitated with cut tow, and the upper and under plates joined. This may be accomplished by bringing them together, and boring four small holes with an awl, two at one end, the one above and the other beneath the suture, and the same at the other end, uniting them by means of fine annealed wire. Cement may also be used with advantage in this operation. The carapace may be cleaned with a weak solution of nitric acid and water, washing it freely; afterwards it may be oiled and rubbed with a piece of flannel.

Of crocodiles and lizards in general. — All of the smaller species should be preserved in spirits, of about 75 per cent strength. The larger of this group are skinned in the same manner as a quadruped; especial care is, however, required in skinning the tails, as they are very liable to break. But little preservative is needed, the skins being of a dry nature. They may also be stuffed in the same manner as a quadruped, and little skill is required to get them in shape.

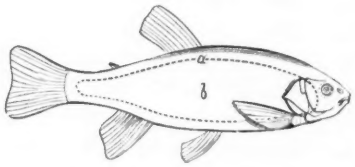
Of serpents. — With the larger specimens, such as cannot be readily preserved in alcohol, the following method should be adopted in removing the skin. Open the mouth to its utmost capacity and insert therein a stick to retain it in this position. With the aid of the scalpel sever the body from the head within the skin, leaving no attachments whatever.

Grasp the body with the pincers and pull it out through the mouth, and fasten it to a hook. The body is now to be pulled from the enveloping skin; to accomplish this it is necessary to avoid all strain, that the scales upon the outside may not be disarranged, using the scissors and scalpel to sever the ligaments which bind the skin to the carcass. There is no necessity of turning the skull, but the brain should be removed through an opening at its base. The muscles within the mouth, and the eyes, should also be taken away. The whole should then be anointed with the preservative, and the skin reversed to restore it to its natural position. Before stuffing, suspend the skin in a vertical position, with the head uppermost. The form can now be restored with sawdust; this may be run through a tunnel, using a slender stick, from time to time, to lay it evenly. Having reached the mouth insert some putty to keep the sawdust from spilling out. The specimen may now be taken down and bent into any position wished, being supported by a wooden framework until thoroughly dry. In order that the specimen may be free from the attacks of noxious insects it is well to soak the sawdust in a solution of carbolic acid and water previous to placing it within the skin; and it should be thoroughly dry, otherwise the skin is liable to mould. Sand can also be used to imitate the form, but the chief objection is its great weight.

Of the method of skinning and mounting fish.—This class of animals possess many beauties, which, when thus removed from their native element, vanish forever, and it is in vain for the taxidermist to try to imitate those iridescent tints which characterize the living specimens. The best he can do is to preserve in form and general outline those characteristics by which he may be able to recognize his subject. Before proceeding to describe the operation of skinning it may be well to state that the scales, as well as their color, may be preserved to a certain degree by applying tissue paper to them, which, from the natural glutinous matter

which covers the scales will adhere firmly; this being allowed to remain until the skin has dried may be easily removed by moistening with a damp cloth. All small fish should be mounted in section, while the larger varieties may be preserved entire. Suppose the fish to be of such a size as to be mounted in section, first, it is necessary that it be as fresh as possible, as the scales will become detached if decay be allowed to commence. Lay the fish on one side and cover the side uppermost with tissue paper, as stated above; also extend the fins by means of the same, and allow them to remain a few moments until they become fixed and dry; this will be a protection to the fins and scales during the process of skinning. Having provided yourself with a damp cloth spread it smoothly upon the table, and place the fish upon it with the papered side down. With the dissecting scissors cut the skin in the manner indicated by the dotted line *a*, in Fig. 77, and remove the skin (*b*) included within the line. The remaining skin must now be detached from the flesh, beginning at the head and separating it downward toward the tail. The spine must be severed close to the head, and also at the tail, and the entire body removed. All the flesh having been taken from the skin, and the eyes removed, the inside must be wiped out and the preservative applied. It is necessary here to repeat the caution not to use any unnecessary strain that will be liable to distend the skin. The skin should now be filled with cotton or tow, and this must be laid so evenly that there shall be no prominences upon the outside of the same. When filled it should be laid with the open side down, upon a board of proper dimensions previously prepared, and fastened to it by means of small tacks, commencing at the head, and fastening the edges (as at A, Fig. 77) downward toward

Fig. 77.



the tail. It should then be set aside in the air to dry, care being taken not to expose it to the rays of the sun. When dry the paper which covers the exposed side and with which the rays are distended, may be removed in the manner previously stated, and the glass eyes inserted with a little putty. As the glass eyes used by taxidermists are generally too spherical, and polished, it is well to manufacture them of wood, using common paint to restore the color, avoiding the use of varnish. Finally the skin should receive a coat of thin colorless varnish, after which it is ready for the cabinet. In sharks and large fishes an incision should be made below the head at its base, along the ridge of the back, following to either side of the dorsal fin down to the tail. The skin can then be separated on each side, and by severing the vertebræ at the head and tail, the entire body may be removed. The tail having been skinned, the head should be pushed inwards and the skin passed over it, when all the cartilage can be freely cut away. In stuffing these large species it becomes necessary to use a body support, and a bar of light wood may be used for this purpose; this should enter the skull, thereby being more easily kept in position, and extend to the base of the tail. Hooks can be fastened to this bar, and by means of wire the specimen can be suspended from above. The body should then be stuffed with hay, and the incision upon the back carefully sewed up. If the first coat of varnish is observed to rise in scales it should be removed with a solution of nitric acid and water, and the skin allowed to dry, when a second application of varnish will ever afterwards remain quite solid.

We may state in conclusion that with the exception of large turtles, alligators and their allies, large sharks and a few other fishes of great size, stuffed specimens of the two classes of reptiles and fishes are very unsatisfactory to the naturalist, and that whenever it is practicable to preserve the specimen in alcohol that method should be adopted in place of skinning and stuffing.

THE FRESH-WATER AQUARIUM.

BY C. B. BRIGHAM.

(Continued from page 377.)

It is useless, even were it possible, to give the exact amount of plants that are necessary to keep an aquarium in order. A very few pieces will be sufficient to purify the water, but as some water-plants are very beautiful, it may be desirable to have the maximum rather than the minimum amount of them in the aquarium. The fishes should have space enough to move around freely, and at the same time to be seen to advantage. Bearing this in mind my own taste would be to have as many plants as the tank would allow. As the water in the tank is changed from time to time the plants can be thinned out and the decaying stalks cut off.

The live stock of the aquarium is generally selected from fishes, lizards, snails, and mussels. One word as to the propriety of having many kinds of fish together in one tank. Some fish, such as sticklebacks or pickerel, are so voracious that either the other fish are wholly eaten up by them, or else their fins or tails are so maimed that they become objects of pity instead of amusement. Again, in selecting a stock of fish we should try to have them of a size proportioned to the tank they are to be put in. It is a great mistake to have in the tank a fish so large that it can hardly turn about; as a general rule, in our common sized tanks, the smaller the fish the better. At the same time we thus have a chance of having more specimens without diminishing too much the supply of oxygen. It is often very difficult to get small specimens of some kinds of fish, such as perch or eels. At certain seasons in the year it is the custom, in some places in the country, to draw off the water in the mill-pond and make repairs; if such a chance presents then is

the time for the lover of the aquarium to enjoy himself, for as the water is left in small, shallow holes, here and there, we shall find in these places multitudes of specimens only waiting to be preserved, — small perch in great numbers and many rare larvæ among the plants. At such a time too, we can make a choice of mussels, selecting for their beauty those whose shells are rayed with the darker shades of green. Very young bream are easy to catch in the net. Not so with those an inch or more long, and now is the chance offered to get as many as we wish. Perch and bream both need a good deal of care to make them live the year round in the tank, but they will repay a little trouble, as they become so tame if properly cared for. Speaking of the tameness of fishes it seems to be more a question of food than anything else; if fishes are fed at certain times, and are compelled to come to the top for the food they soon get into the way of coming up whenever one is near by, and will even jump out of the water at the bare finger. There is a little fish, found mostly in slowly running streams, called the roach; it is a very interesting fish for the aquarium on account of its peculiar shape and habits; it has two large side fins just behind the head, which it always keeps fully extended, looking as if it had an old-fashioned collar on. It remains motionless for the most of the time on the bottom of the stream, occasionally starting off, perhaps in search of food, only to sink down again to its former quiet position; it is easy to keep this fish in good condition in the aquarium. Young pickerel are desirable fish to have in the tanks if one can afford to keep only that kind of fish; placed with larger fish they do very well and constantly recommend themselves for their elegant movements, but with small fish, such as minnows, they live in constant war. In one of my tanks twenty-four minnows were killed within a week by a pickerel about an inch and a half long, and this while giving the pickerel a regular course of feeding on beef. Minnows have always held a high rank among the

fishes to be selected for the aquarium; collecting together in schools, tame, hardy and lively, they have qualities which few aquarial specimens possess. The stickleback (*Gasterosteus*) of which there are several varieties, is hardly a fish for the general collection; although of exquisite form, it is so fierce, especially in the breeding season, that it incessantly attacks the other fishes in the aquarium, and in a short time deprives them of more or less of their tails, making the unfortunate victims literally top-heavy, swimming with their tails, or rather what were once tails, much higher than their heads.

Sticklebacks should have a tank devoted exclusively to them and this especially if we wish them to build a nest, one of their peculiar accomplishments. Early in the spring the sticklebacks may be found in great numbers in the small ditches which drain the salt-water marshes. The male is easily distinguished from the female by its deep red color around the gills and its blue eyes, while the female has only the silvery scales. A pair taken at random usually live peaceably together; if it is in the right season they will soon look about for materials for a nest, taking bits of water-plants and even coming to the surface for small pieces of straw and sticks; with such materials they build a round nest about as large as a small English walnut, hollow in the centre and having two holes large enough to admit the fish on either side; the nest is built upon the branches of some of the water-plants. While the female is laying the eggs the male acts as guard, fiercely driving away anything coming within a certain radius of the nest. When the eggs are laid they resemble small globules of wet sago more than anything else. The female will be seen to fan these eggs quite often with her fins; this is probably to give them fresh water and to prevent any sediment from collecting upon them. After a fortnight or so, instead of eggs, we see in different parts of the tank what at first look most like very minute gold spangles as large as the head of a small

pin. On closer examination we find that they are the eyes of a very small fish. Their growth is so slow that in order to preserve them it will be well to remove them to a small tank by themselves, where they can be fed by placing a piece of raw beef on the end of a string, and hanging it over the edge of the tank into the water until it is turned white, when another piece can be introduced. The stickleback, as also the minnows, is easily accustomed to fresh water by freshening the salt-water gradually until it is quite fresh and then introducing the fish into the tank. The stickleback is not the only fresh water, nest building, fish. Wood mentions a curious fish found in tropical America, called by the natives the hassar; a fish which builds a nest as carefully as the stickleback, though one "not placed in the water but in a muddy hole just above the surface." Whether we have gold fish or not in the aquarium, is a matter of taste, some persons thinking that they give the aquarium a common fish-globe look. It seems to me if we can get some small ones of a brilliant color, and of good proportions, we should be glad to receive them into the tank. The great trouble with gold fish is that they are apt to be so deformed, some with the gaunt look of a starved fish, others with a hump on the back or a larger or smaller number of fins than usual. Gold fish would be worth keeping in the aquarium for their remarkable color alone if for nothing more.

Small eels and horned pouts add to the variety of fishes in the aquarium, but both are so uneasy and so very voracious that they are not pleasing inmates of the tank; wandering up and down the sides of the tank, they seem discontented and ill at ease. Young alewives are so beautiful that one is tempted to try them in the aquarium; rarely do they flourish in it.

One of the most interesting animals for the aquarium is the triton, or water-newt; these tritons are often found in what are called, in the country, pond holes, seldom in brooks or ponds; they are perfectly harmless and will remain on the

warm hand as long as one has patience to hold them; they come up to the surface to breathe, and therefore do not consume much oxygen; they are perfectly hardy and easy to keep alive, eating small pieces of beef eagerly; they occasionally change their skins, bringing the old skin over their heads and then swallowing them just as toads do. Their odd motions in the water, often poising themselves on the end of the tail or on one toe, are very amusing. They lay their eggs in the early spring either on or between the leaves of water-plants. By the middle of August the young are nearly two inches long; they breathe at first with gills, but by September they come to the surface for air, as the older ones do. These tritons outlive all the other specimens in the tank, and they live so peaceably with their companions that they are invaluable as aquarial specimens. — *To be concluded.*

REVIEWS.

THE DEVELOPMENT OF INSECTS. — Naturalists are now paying increased attention to the embryology of the articulates. After Rathke, Herold, and Kölliker had published their memorable works, there was an interval of twelve years between the publication, in 1842, of Kölliker's celebrated tract, entitled in Latin, "Observations on the first Genesis of Insects," and Zaddach's "Researches on the Development and Structure of Articulated Animals; Part I. The Development of Phryganidan Eggs," which appeared in 1854. Then followed Leuckart's "Propagation and Development of the Pupipara, from observations on Melophagus ovinus;" Huxley's article in the Linnæan Transactions, on the "Reproduction and Morphology of Aphis;" and Lubbock's essay on the "Ova and Pseudova of Insects," in the London Philosophical Transactions for 1859. Claparède, in 1862, published his splendid and beautifully illustrated prize essay on the "Evolution of Spiders," and a year after Weismann followed with a succession of brilliant works on the "Embryology and Anatomy of Diptera," which are in many respects the most important essays on the embryology of the hexapodous insects that have yet appeared, while the illustrations, very copious and detailed, are the most elaborate we have yet seen. Of great importance also is Mecznikow's "Researches on the

Embryology of the Hemiptera (Aphis, Aspidiotus, Corixa), and Simulium, and the viviparous Cecidomyian larva," which were printed in Siebold and Kölliker's Journal, in 1866.

At the meeting of the American Association, in August, 1867, the writer presented a paper on the Development of a Dragon-fly (Diplax), an illustrated abstract of which appeared in the NATURALIST, vol 1, p. 676. His studies did not embrace the earliest changes in the egg, but only those observed after the rudiments of the head and appendages appeared. In 1868 Dr. Alex. Brandt presented to the Imperial Academy of Sciences, of St. Petersburgh, a paper entitled "Contributions to the Developmental History of the Libellulidæ (Calopteryx and Agrion) and Hemiptera, with especial reference to the Embryonal integument" (blastoderm). With these two papers, the latter relating to the earliest changes in the eggs of Dragon-flies, and the former to the later stages in the life of the embryo, we have quite a complete account of the evolution of this remarkable family of insects. Dr. Brandt also gives the developmental history of certain Hemiptera (Corixa, Hydrometra, Lecanium and Aphis), and shows the remarkable identity in the embryology of these insects with the neuropterous insects mentioned above. A few other articles have appeared by Newport, Van Beneden, and others. We have already in the present volume of the NATURALIST, quoted from the abstract of Robins' paper on the "Development of Mites," quoted from the "Comptes Rendus" of the French Academy.

We would now notice the last work on the embryology of insects, that of Claparède, entitled "Studies on the Acarina," and published in Siebold and Kölliker's Journal of Scientific Zoölogy, during the present year. Claparède has observed in Atax Bonzi, which is a parasite on the gills of fresh-water mussels, that out of the originally laid egg (Pl. 8, fig. 3, embryo of *Tyroglyphus siro*, which closely resembles the earliest stages of the embryo of Atax; *vt*, yolk; *md*, mandibles; *mx*, maxillæ; p'–p''', legs. Fig. 4, front view of the same; R, beak; *p*, maxillæ), not a larva, but an egg-shaped form hatches, which he calls a "deutovum." (Pl. 8, fig. 1, bursting of the egg-shell into two halves, *mo*, on the day the deutovum, *dm*, hatches out; *md*, mandibles; *mx*, maxillæ; p''', third pair of legs; *lh*, body cavity; *sp*, common beginning of the alimentary canal and nervous system; *amb*, hæmabœba, amœba-like bodies, which represent the blood corpuscles; there being no circulation of the blood, the movements of the hæmabœba constitute a vicarious circulation. Fig. 2, the deutovum free from the first egg-shell; lettering same as in Fig. 1; *oc*, rudiments of the simple eyes; R, beak, hh', rudimentary stomach and liver). From this deutovum (which is not the "amnion" of insects), is developed a six-footed larva. This larva passes into an eight-footed form, the "second larva" (the "nymph" or pupa, of Dujardin and Robin) which transforms into the adult mite. The pupa differs from the adult in having longer feet, and four instead of ten genital clasping cups, the latter being the usual number in the adult.

The larvæ are elongated oval, with six long legs and four ocelli. They swarm over the gills of the mussel they are living on for a short time, and then bore into the substance of the gill to undergo their next transformation. Here the young mite increases in size, and becomes round. The tissues soften, those of the different organs not being so well marked as in the first larval stage. The limbs are short and much larger than before, the whole animal assuming an embryo-like appearance, and moving about like a rounded mass in its enclosure. Indeed is this process not (though Claparède does not say so) a histolysis of the former larval tissues, and the formation of a new body, as in the change of the six-footed insect beneath the larva skin where the pupa is formed? A new set of limbs grow out, this time there being four instead of three pairs of legs, while the old larval skin is still embraced within the membrane containing the second larval round mass. Soon the body is perfected, and the pupa, as we may properly call it, slips out of the larval membrane.

The "second larva" after some time undergoes another change; the limbs grow much shorter and are folded beneath the body, the animal being immovable, while the whole body assumes a broadly ovate form, and looks like an embryo just before hatching, but still lying within the egg. This may also be comparable with the formation of the adult fly within the puparium. (Compare Weismann's account of this process in Musca, in our "Guide to the Study of Insects," pp. 63, 64.) This period seems to be an exact repetition of the histolysis, and the formation of new tissues for the building up of a new body, which preceded the pupal stage, while the adult mite slips out of its pupal membrane, just as the pupal mite throws off its larval membrane, like an adult butterfly, or fly, emerging from its pupal membrane.

Thus the mites, at least several species, pass through a series of metamorphoses similar to those of such insects as have a complete metamorphosis (except that the Acarian pupa is active), while the absence of such metamorphosis in the spiders, is paralleled by the incomplete metamorphosis of the orthoptera and many neuroptera, which reach adult life by simple moultings of the skin.

In the genus Myobia there is not only a deutovum, besides the original egg, but also a *tritovum-stage*. The eggs of this mite are long, oval and conical at the posterior end. The embryo with the rudiments of limbs is represented by Fig. 5 of Plate 8. The little tubercles *md* and *mx*, represent the mandibles and maxillæ, while the three pairs of legs, $p'p''p'''$, bud out from the middle of the body: *lc* represents the head-plate. The maxillæ and mandibles finally unite to form a beak (R, Fig. 6) and the three pairs of feet ($p'p''p'''$) are folded along the median line of the body. The farther development of the embryo is now for a time arrested, and a peculiar tooth-like process (Fig. 7, *d*.) is developed. Claparède thinks that by means of this the anterior end of the egg-shell is cut off, and the embryo protrudes through, when (as in Fig. 7) it is seen to be surrounded by a new membrane, the deutovum (*dt*), equivalent to that of Atax. The

front pair of legs (p') have grown larger and stand out in front and on each side of the beak (R). The growing embryo again forces off the anterior end of its deutovum, and the oval end of the egg protrudes through, and is surrounded by another membrane. This is the *tritovum*. The embryo is now surrounded by the membrane of the tritovum, and also by the deutovular membrane and the original egg-shell, the last two having lost a small portion of the anterior end. During the tritovum-stage the fore pair of feet become curved in like claws, and the beak sinks down into the body.

Now the six-footed larva (Fig. 8) breaks through the shell, and closely resembles the adult (Pl. 8, Fig. 9). The first pair of feet modified for grasping the hairs of the field mouse, on which it is a parasite, take the place of the maxillæ, which have been arrested in their development, and the mandibles (pr) assume a style-like form. After one or more moultings of the skin, a fourth pair of feet (p'''') are acquired, and the adult form results, which the author considers as the type of a new family of Acarina. Claparède also suggests the affinity of Myobia to the Tardigrades (Echiniscus and Lydella,) especially from the study of the structure of the style-like mandibles and their supports. We feel convinced, from the study of Claparède's figures and descriptions, that this comparison is very significant, and this has led us to consider the Tardigrades as a family of mites, related to Myobia and Demodex.

The developmental history of Tetranychus is fully given, and he shows that, in regard especially to the mouth-parts, it passes through an Ixodes-like stage, the beak of the young closely resembling that of the tick. Also, in less complete form, that of a species of Tyroglyphus, in which he shows that the genus Hypopus, which strongly resembles Gamasus, is the male state of several species of Tyroglyphus. Such species with Gamasus-like males he states should be separated from the true Tyroglyphi under the name of Hypopus. He also gives the developmental history of Hoplophora. Since many Oribatidæ pass through an Acarus-like stage, he, with Gervais, places them next to the Acaridæ. He likewise describes *Myocoptes musculinus* (Koch) a form allied to our *Dermaleichus pici-pubescentis* (see Pl. 6, Figs. 1, 2, 3.) The work is very fully illustrated with ten beautifully drawn folding plates.

The author concludes with a short chapter entitled "Für Darwin." He considers that many points in the organization of the mites, in relation to their modes of life, confirm the truth of Darwin's theory of the origin of species. He cites the structure of the clasping organs attached to the legs, by which they are enabled to grasp the hairs of their host, and instances the alternation in form and position of the first pair of legs in Myobia, and their wonderful adaptation for grasping the hairs of the mice on which they live. He also cites the case of a species of Hypopus, in which, as described by Dujardin, there is, on the hinder edge of the abdomen, two scoop-like lips by which they cling to the hairs of their host.

THE GENERATIONS OF WORMS.*—Our readers are already familiar with the strange alternations of generation observed in many of the lower intestinal worms. Like successions of forms differing remarkably from the parent, probably occur even in the most highly organized annelids. In the present Journal Dr. Malmgren, known by his elaborate works on the Annelids of the Northern and Arctic Seas, cites what he supposes to be another case, referring the species of "Heteronereis" (which had been considered by earlier observers as a good genus, and may be found swimming on the surface of the ocean, as we have observed it on the coast of Labrador), to certain species of the genus Nereis, which live in the mud or swim at the bottom. The actual connection has not been yet traced, but the author is strongly of the opinion that it will be found that the Nereids are the parents of the Heteronereis, and also of the species of Iphinereis, another genus allied to the former.

FLORIDA AND THE SOUTH.†—Travellers and naturalists in Florida will find in this little book a reliable guide to its hunting grounds and sanitary retreats, by one already well known as a writer on the history of Florida. The traveller should also take with him the articles on the shell-mounds of Florida, by Prof. Wyman, published in our second volume, and those of Mr. Stearns, which are now appearing in the NATURALIST.

ANNALS OF BEE CULTURE.‡—We should judge that this annual was a very timely production. The articles, mostly written by the Editor, are such as must interest and instruct bee-keepers, and we gladly hail every publication which has for its aim the improvement of the art and science of bee-keeping. The Editor proposes to issue another annual early in 1870.

NATURAL HISTORY MISCELLANY.

BOTANY.

TENDENCY OF FLORAL ORGANS TO EXCHANGE OFFICES. I have before me a curious instance of the tendency which floral organs have to exchange offices. It is a staminate spike of corn well developed, and of normal growth for some five inches from its insertion on the stem, but bearing on its apex a well defined little ear of grain, as regular in structure as those which were born in their accustomed place. I do not know how common this may be, but I never before chanced to see it. — C. J. S.

* Siebold and Kolliker's Journal of Scientific Zoology, 1869.

† A Guide-book of Florida and the South, for Tourists, Invalids, and Emigrants; with a map of the St. John River. By D. G. Brenton, M. D. Philadelphia, 1869. 12mo, pp. 136. Penn. Publishing Co. $1.00.

‡ Annals of Bee Culture for 1869. By D. L. Adair, Editor. Louisville, Ky. 8vo, pp. 57.

HERBARIUM OF THE LATE DR. WALKER-ARNOTT. — The herbarium belonging to the late Dr. Walker-Arnott has, since his death, been acquired by the Glasgow University. Included in this is his magnificent collection of Diatomaceæ, which is contained in three large cabinets, and consists of fully ten thousand specimens, all mounted upon glass slides, ready for examination by means of the microscope. The specimens put up in tubes, from which slides can be prepared, will most likely be acquired by Dr. Eulenstein, the well known German diatomist, who will thus be enabled to push forward, it is to be hoped, the new edition of Pritchard's Infusoria, upon which he has been for some time engaged. The herbarium is a very large one, being contained in twenty cabinets, each of which holds at least four thousand specimens. The botanical library goes with the herbarium, and thus will be stored in a safe resting-place, the results of the labor of fifty years in the life of this eminent botanist. —A. M. EDWARDS.

NEW LOCALITY OF ASPIDIUM ACULEATUM (L.) SW. This fern, though widely distributed over the globe, is rare in the United States, being confined to a few mountains and high valleys in New England and New York. It has been collected in the White Mountains of New Hampshire, near the summit of Mt. Willoughby, and in the Notch at the north-eastern base of Mt. Mansfield, Vermont—and among the Adirondack mountains, N. Y. To these localities we may now add "Stony Clove," Catskill Mountains, N. Y., — where the writer found it in August of this year, growing abundantly, under conditions very similar to those of Mt. Mansfield Notch. This locality is one hundred and forty miles farther south than any previously known in our country. — JOHN H. REDFIELD, *Phila.*

ZOÖLOGY.

A REMARKABLE ECHINODERM. — At the meeting of the Scandinavian Naturalists at Christiania in 1868, Professor Lovén laid before the Zoölogical section the figures and description of a very remarkable Echinoderm from the Torres Straits (off Cape York), termed *Hyponome Sarsi.* It forms, in a new and very unexpected manner, a link between the palæozoic and the recent animal life. It is, strange to say, most nearly allied to Cystidea, especially to Agelacrinus, and will, no doubt, when its anatomy shall be known, give us a full clue to the comprehension of this enigmatic zoölogical type. The animal (which appears not to have lived fastened to the bottom of the sea) resembles a star-fish, with fine short and thick, but dichotomously branching arms; it had no stem. Five ambulacral furrows are present, giving off branches to the branches of the arms, and farther to several small club-like swellings of the skin, covering the superior, or ventral surface; but only these terminal or distal parts of the ambulacral furrows are open; in the rest of their course towards the centre of the disk they are covered up or converted into

vaulted galleries, converging towards the central, but exteriorly *invisible* mouth. This covering up of the ambulacral furrows was effected by means of the limiting plates joining each other altogether from both sides; but that the food is picked up in the open parts and conveyed to the invisible mouth, is demonstrated by the fact that small heaps of small crustacea and other minute animals were found in them. With the exception of a smooth, triangular space on the back, with a group of small pores in the centre (we do not yet know whether these pores are genital outlets or perhaps play the part of a "madreporite") the whole dorsal and ventral surface is covered with small irregular calcareous plates; but in one of the interradial areas of the ventral surface arises an anal tube, or "proboscis," evidently quite analogous to the anal tube of Antedon, Pentacrinus, Rhizocrinus (and all other recent crinoids, with the exception of the little known Holopus) to the "pyramid" of Agelacrinus, Caryocrinus and Cystidea generally, and to the short or long proboscis of most palæozoic Crinoids, with a hard, tessellated cover of the calyx. It has been a great puzzle, that a mouth, separate from the anal "proboscis" could not be detected in most of the palæozoic Crinoids, now we know where to find it. Mr. Billing's discovery of subterminal ambulacral channels, or vaulted galleries, situated quite below the unbroken perisome, and radiating from the arms towards the central part of the disc, shows clearly, when elucidated by the analogy of the half open, half closed ambulacral channels of Hyponome, that the mouth in these old sea lilies was *internal, hidden and invisible*, and that the "proboscis" had nothing to do with it, but was simply the excretory part of the digestive system, as pointed out already in 1866 by Dr. Schultze, in his excellent Monograph of the Echinoderms of the Eifel. — Dr. C. F. Lütken, Copenhagen.

The Tennessee Warbler. — I was much surprised at the statement of Mr. Boardman in the June number of the Naturalist, that the Tennessee Warbler is a common species in Maine during the spring. In the article to which he refers, I stated that it was rare in New England, rather on the authority of writers on ornithology than as the result of my own observations. Audubon says that the Tennessee Warbler is rare, and that it extends northward only as far as New York. Wilson met with but three specimens. Nuttall makes no mention of it among the birds of New England. Girard never met with it on Long Island; and De Kay says it is rare in the State of New York. I, myself, have never met with more than two specimens.

It is a very curious fact that this bird should be so rare in New York, and yet so abundant in Maine. All the other Warblers that enter New England in the spring pass through New York and New Jersey, where for a few days they are as abundant as they afterwards are in the New England States. Either the Tennessee Warbler must migrate with extraordinary rapidity, thus escaping detection, or else it must pursue a more westerly route than the other warblers, turning eastward only when it has journeyed a considerable distance north.—T. M Trippe, *Orange, N.Y.*

GOLDEN-WINGED WARBLER. — Dr. Coues in his "List of the Birds of New England" gives this bird as a "very rare summer visitant to the more southern portions. On page 214 of Mr. Samuels' work, I stated that I had found it occurring sparingly in May for several seasons. Since writing what I did I have observed the Golden-winged Warbler more plenty than ever, and as late as the middle of June, and in the same locality early in August with young. I felt, therefore, quite confident that it breeds here. This June (1869) Mr. J. C. Maynard has had the rare good fortune to find a nest and four eggs. Mr. Allen tells me that since publishing his list he has found it at Springfield in summer, and Mr. Jillson, of Hudson, writes me that it breeds in his locality, though I am not aware that he has actually obtained the nest. I wrongly stated in my letter to Mr. Samuels that this species, probably, proceeded North to breed. From my observations and knowledge of the bird at that time, I supposed it did so. Probably this state is about its northern limit on the Atlantic. — H. A. PURDIE, *West Newton, Mass., June*, 1869.

CORAL SNAKES. — A number of species of very different genera are confounded under this name by the inhabitants of tropical America. Their general appearance is attractive, being banded with red, black, and white. Some of them belonging to the genus *Elaps* are poisonous, though some of these are very mild and indisposed to bite. Others, belonging to the genera *Pliocercus, Erythrolamprus, Ophibolus, Oxyrrhopus*, etc., are quite harmless, but can only be distinguished from species of *Elaps* by a careful examination of the scales and teeth. The mimetic analogy presented by these species with species of *Elaps*, according to Prof. Cope, is very remarkable.

During a stay of a few days in Greytown, Nicaragua, an alcoholic specimen of a snake, called a "coral" snake and regarded as extremely poisonous, was added to our collection by a resident. Under the direction of Mr. Robert Kennicott, the naturalist in charge of our party, who had devoted several years to the study of reptiles, we examined the snake in question, compared it with other snakes known to be poisonous, and were fully satisfied that it was quite harmless notwithstanding the absurd stories which were related of it. I afterward brought in one of these snakes alive, and after examining the dentition with Mr. Kennicott, and confirming our previous opinion as to its harmlessness, it was preserved in alcohol. Asking Mr. K. what the species was, he answered that it belonged doubtfully in the genus *Elaps*, as it was a harmless snake, and was perhaps a new species of his own.* Not being a herpetologist, in a recent article in the NATURALIST I adverted to the circumstance, and used Mr. Kennicott's name as he wrote it in my note-book. An esteemed correspondent, in some remarks about the inadvisibility of handling unknown snakes reported to be poisonous, which I thoroughly

*I have since been informed on good authority that the species to which he referred it is confined to *Sonora*.

agree with in general, rather hastily referred the case in question to the same category. A second glance would hardly have seen either bravado or foolhardiness in the capture of a snake of which an alcoholic specimen just previously examined, had given incontrovertible proofs of its utter harmlessness. — W. H. DALL.

THE BLACK VULTURE IN MAINE. — I had sent me (shot in this neighborhood) a good specimen of the Black Vulture (*Cathartes atratus*), the first one I ever knew so far east; and also a fine specimen of the Purple Gallinule (*Gallinula martinica*). — G. A. BOARDMAN, *Calais, Me.*

MICROSCOPY.

METHOD OF PRESERVING ANIMAL SPECIMENS FOR FINE DISSECTION. — Microscopists will read with interest a very simple method of preserving animal specimens for fine dissection. It is described by Dr. Alcock. The advantages of the plan are very perfect preservation; no necessity for closing up, so that the specimen cannot be got at; no fear of losing a valuable dissection from accidental evaporation, as when spirit is used; lastly, cheapness. The method adopted is to prepare a saturated solution of corrosive sublimate in alcohol, and when a dissection in water is in progress, a small quantity — half a teaspoonful — of the solution is to be added from day to day if the slightest appearance of putrefaction is observed, but no more of it is used than is absolutely necessary; and by the time the dissection is completed, the specimen has become imperishable from the union of the corrosive sublimate with the tissues, and it may then be kept in pure water, either open or mounted, in the usual way. — *Quarterly Journal of Science, London.*

GEOLOGY.

THE EOZOÖN IN ESSEX COUNTY. The remains of this, the oldest form of animal life thus far discovered on our globe, and found in the azoic [Laurentian] rocks of Ottawa, Canada, have, it is confidently believed, been within a few days detected in the serpentine of our "Devil's Den." The animal, if it may be so called, has been arranged by naturalists among the rhizopods, and would seem to have been a jelly-like living mass, spreading out on the bottom of the sea, capable of secreting calcareous partitions, and thus forming small chambers or cells, the interior of which has become filled by serpentine, which was deposited from the waters of the ocean, and took the place of the decomposing animated mass. This discovery, resulting from a visit of Prof. T. Sterry Hunt of Montreal to our neighborhood, will excite new interest in our limestone and serpentine quarry among geologists, and throw additional light upon the character and age of the rocks in this region.

Mr. Edwin Bicknell (Preparator of the Peabody Academy of Science, Salem), has, by a careful microscopic comparison of a specimen of Eo-

zoön, furnished by Dr. Dawson of Montreal, with one from the Devil's Den, fully established the discovery. In a letter from Mr. Bicknell which we have seen, he says — "I have no hesitation in saying, if the Canadian specimen is Eozoön, the Newburyport one is also." — H. C. PERKINS.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Prof. A. E. VERRILL read a paper "On the comparison of the Coral Faunæ of the Atlantic and Pacific Coasts of the Isthmus of Darien, as bearing on the supposed former connection between the two Oceans. The question of a former connection between the Atlantic and Pacific, across the Isthmus of Darien, has very important bearings both in Zoölogy and Geology. With many geologists it has been a favorite and convenient theory to account for climatic changes in Europe by a depression of the Isthmus sufficient to allow the Gulf Stream to flow into the Pacific. Admitting a connection it does not necessarily follow that the Gulf Stream would flow into the Pacific, for a current in the opposite direction might result, while with a shallow channel, owing to the difference in the tides (twenty-two feet at Panama and about two at Aspinwall) it is probable that the flow would be first one way and then the other. The evidence from Geology is quite insufficient to establish the theory, and the facts cited have in most cases proved unreliable. The zoölogical evidence is mainly the occurrence of identical and closely allied species on both sides. Thus of mollusca about fifteen hundred species occur upon the west tropical coast, of which Dr. P. P. Carpenter enumerates thirty-five species as identical upon the two coasts; thirty-four as doubtful, but possibly identical; and sixty-seven that are closely allied, but evidently distinct. Since his lists were published other species have been added to them, among which *Paphrydia bullata*, a common West Indian shell, which has recently been received with *Codakia tigerina* from the Gulf of California, by the Museum of Yale College. Dr. Stimpson admits eight or ten species of Crustacea as identical, and although Mr. Ordway has separated the *Callinectes* of the west coast satisfactorily, there are other identical species among the large collections recently received from that coast by the Museum of Yale College, through Mr. Bradley and others, so that of about 150 species of Decapods, ten or twelve appear to be perfectly identical, not showing even varietal differences. Among 173 species of marine fishes from both coasts Dr. Günther regards fifty-seven as identical. Mr. Gill would, however, separate some of these forms, but the general result would still remain the same, since certain species do not show even varietal differences. The Echinoderms of the two coasts have been examined and tabulated by the author* and gave very different results, for of eighty-two species found on the west coast none

*Transactions of the Connecticut Academy, Vol. I, p. 339, 1867.

are identical with those of the Atlantic, unless two Holothurians which may be regarded as doubtful, though considered the same by Selenka. But at least fifty of the species are analogous, or correspond with similar Atlantic species.

A careful comparative study of the corals and Polyps of the Atlantic, and extensive, and, for the shallow water forms, nearly complete collections from various localities on the Pacific coast, give quite unexpected results, since no species are found to be identical, while even the genera and families show remarkable contrasts. Thus the numerous genera and families of reef-building corals, so abundant on the Atlantic side, are wholly wanting on the Pacific, with the exception of Porites, which is represented by three or four small species. Massive Astræans, Mæandrina, Diploria, Manicina, Colpophyllia, Agaricia, Siderastræa, Oculina, Madrepora, Millepora, are wholly unknown in the Panama fauna. But Pocillipora, Montipora, and Pavonia, genera unknown on the Atlantic side, are represented, the last by two gigantic species. Among the Halcyonoid Polyps we find an equal contrast, for Eunicea, Plexaura, Plexaurella, Pterogorgia and many other very common Atlantic genera are unknown on the Pacific side, where they are replaced by numerous species of Psammogorgia, Litigorgia, and Eugorgia, which are eminently characteristic of that coast.

The genus Muricea is very common, and represented by seventeen species, while on the Atlantic side only four species are usually admitted, all of which are so different as scarcely to be regarded as analogous species. The genus Renilla is found on both coasts. Among the Actinians we find greater resemblances, but as yet no identical species.

From these facts we may legitimately conclude that no very extensive or deep connection, sufficient to alter the course of oceanic currents, can have existed since the coasts have been inhabited by the existing species, otherwise a greater admixture must have taken place. A narrow or shallow channel of communication would probably account for all identical species yet observed, but at what period it may have existed is still another question. The occurrence of certain Atlantic species in the Gulf of California and not at Panama (*Codakia tigerina*, *Paphrydia bullata*); the evidence of a uniform and long continued flow of the Gulf Stream, to be derived from the growth of the extensive coral reefs of the Bermudas, and the southern extension of Florida with its numerous ancient reefs of coral rock, one of which occurs even as far north as Tampa Bay, made up of existing species, show that the present coral faunæ are of immense antiquity, and also that the specific characters are wonderfully persistent. The peculiar relations between the two faunæ manifested by the numerous analogous but distinct species and genera are probably facts of a different order, and will require a different solution, for even if we adopt a developmental theory we shall doubtless be compelled to refer the period of separation to a period far more ancient than that at which the few identical species became separated, and to admit a far more extensive and prolonged connection between the two oceans.

Mr. G. L. VOSE read a paper entitled "Compression as an agent in Geological Metamorphism; with Illustrations of Distorted Pebbles in Conglomerates." The metamorphic regions are compressed regions. Compression produces heat, and changes not only the outward form but also the mineral nature of the rocks.

Prof. VERRILL, in his paper "On American Phyllopod Crustacea," gave an account of the habits, etc., of our species of Branchipus and Artemia. Of the latter he has obtained two new species, one from Mono Lake, California, and the other in numerous individuals from tubs of salt water on a railroad bridge near New Haven. These tubs, filled from the salt marsh, have become very salt by evaporation in the sun, thus giving the ordinary conditions for the development of this beautiful genus.

In her paper "On the Plumage of the Tern," Miss. G. A. LEWIS described the structure of the feather, illustrating her descriptions with several microscopic drawings.

Miss. LEWIS in her "Thoughts on the Structure of the Animal Kingdom," says, from the radiate to man there does not appear to be any direct line of connection from the higher members of one group to the lower members of the next; on the contrary the nearest allies are found near the origin of the groups. At such points there may be animals combining characters which afterward become specialized in several groups; as there may be some which rise above, whilst others sink below the grade common to the group. A succession of such points marking the origin of the invertebrate branches and the vertebrate classes, might be considered as a spiral around the *axial line* of the animal kingdom. From their respective points of origin the branches and classes proceed, each on its own road towards the perfection of its types, but *not* necessarily turned toward the branch or class above. It is probably the same line perceived by Haeckel, and to which he refers as "commencing with Amphioxus, and proceeding through the Lampreys and the extinct allies of the Sharks to the Lepidosirens, thence through Proteus and its congeners to the Tritons and Salamanders, and thus to the Monotremata (Ornithorhyncus). The line passes through the Marsupials, the Lemurs, the old world Monkeys (Semnopithecus) and the Anthropoid Apes (Orang and Gorilla)."

The axial line was distinguished by the writer in the summer of 1867, and was alluded to in a little pamphlet published in the spring of 1868. She would begin with the lower radiates, pass through the earliest Crinoids, so reaching the origin of the Molluscous branch, ascend through the extinct Cephalopods, and pass the Articulates through the early worms and trilobites. She considered the three great invertebrate branches as lying horizontally at the base of the vertebrate axis. From thence she would pass through each vertebrate group, as it presented itself in the geologic period in which it took its rise, and thus reach man at whatever time he appeared in the Quaternary period. With the production of brain the animal rises from the horizontal towards the polar position of man. There are, however, some very curious exceptions to

this general law. Along the axial line there is a tendency to return to the horizontal in some groups, with an extreme rise towards the polar in others. Between these extremes the group holds its proper level in proportion to the development of brain. Thus there comes to be one line of progression upwards towards man, and many outwards towards the periphery of the branching classes. In the vertebrate branch the birds hold an intermediate position, and, intelligently studied, throw a flood of light backward and forward over the animal world. Taking their rise between the reptile and the mammal they combine with the ornithic, both reptilian and mammalian characters, but the finest development of brain, with its accompanying delicacy of organization, exists at the extremities of the ornithic branch where the true bird type is found, purified, so to speak, of both reptilian and mammalian tendencies. Here we find the songsters and those birds which are most responsive to the influence of man. The axial line for the class of birds, like that of the animal kingdom, is marked by the carrying forward of a mingled stream. It is only near the terminal branches that the pure bird-like forms, the blossoms of the type are found.

The foot in Archæopteryx anticipates that found in the highest groups of birds, and peculiarities of structure drawn from the mammal are not wholly lost until the family of the parrots is passed. Here a rudiment of the diaphragm is found. In the animal kingdom the uncreated man, existing only in the conception of Deity, lifts the whole animal creation and holds it at a higher level.

Mr. MEEHAN also said, in regard to Cassia, that physiologically the leaf was considered the parent of the axillary bud, — and that "adventitious" buds was a term created to account for buds not axillary. The absorption of the bud by Cassia, and the existence of buds, one above another, in other plants, without connection with the petiole, and with the strongest *one the farthest removed from the petiole*, indicated that the leaf was *rather an enemy than an aid to bud development;* and that the classes of *axillary* and *adventitious* buds, had no physiological law to separate them.

MR. LEWIS H. MORGAN gave a conjectural explanation of the Uses of the Embankments of the Mound Builders. Mr. Morgan considered them as the bases (built for defensive purposes) of the *pueblos* or villages of that race of men.

MR. PORTER C. BLISS then read a paper upon a New Classification of the South American Indians upon the basis of Philology. Mr. Bliss gave as one of the results of several years of travel and investigation among the aborigines of the Argentine Republic, Bolivia, Paraguay, Brazil, etc., the discovery that the number of stock languages within those regions has been exaggerated tenfold, and that there are, instead of one hundred and fifty or more as has been loosely stated by the Jesuits and other later writers, but twelve or thirteen stock languages in the Southern half of South America. Of all these he had collected vocabularies.

Mr. Bliss proceeded to point out on a large map of South America, the

localities of each of the tribes mentioned, beginning with the Fuegians, and passing to the two races of Patagonians, the Araucarians of Chile, whom he identified with the Pehuenches, Huilliches and Aucas of the Pampas of Buenos Ayres, the Abipones, Tobas, Mocobis, Ocoles, Mataguayos and Machicuys of the Gran Chaco or region between Paraguay and Bolivia.

He then described the Guaranis and Payaguas of Paraguay, the Atacamus, Quichuas, Aymaras, Chiriguanos and Chiquuitians of Bolivia, and giving many facts respecting the character of their various languages. He adverted to the extensive area of the Guarani tongue, which extends substantially from the La Plata to the Oronoco, embracing a great portion of Brazil and most of the basin of the Amazon. He stated that he had found the Quichua language spoken in the centre of the Argentine Republic, in the province of Santiago del Estero, eight hundred miles from the nearest point in Bolivia where the same language is now spoken. Consequently Mr. Bliss considered this province to have been an outlying colony of the empire of the Incas.

The languages of the Indians of the Chaco are extremely meagre, and none of them exceeds about a thousand root-words.

Mr. Bliss stated that the principle of reduplication was largely concerned in the formation of the language of the Incas, and that he had collected in Bolivia more than three hundred geographical names formed in this way, as Mocomoco, Coro-coro, Quilli-quilli, and cited as a double reduplication the name of the famous lake Ti-ti-ca-ca. He stated that within two hundred years the Guarani language had undergone an almost complete change, so that instead of being now, as formerly, made up from monosyllabic radicals, it is quite as polysyllabic as most other Indian tongues.

Mr. E. S. Morse's paper "On the Early Stages of Brachiopods" was reported in the September number.

Prof. O. C. Marsh read a paper on the "Discovery of the Remains of the Horse among the Ancient Ruins of Central America," the title of which was inadvertently omitted in our list of papers presented to the Association.

Valuable Library for Sale. — The Library of the late Dr. B. F. Shumard, of St. Louis, consisting principally of works on Geology and Palæontology, and believed to be very perfect so far as relates to North America, is offered for sale by M. L. Gray, administrator, No. 105 North 5th street, St. Louis. The Library (and also the collection of Fossils and Minerals, also for sale) can be inspected at No. 1302 Olive street, St. Louis.

ANSWERS TO CORRESPONDENTS.

L. H. P. — The name of your "moss" is *Mastigobrium trilobatum* Nees., and the bit of "light wood" is stained by the *Peziza æruginosa*, a verdigris-green colored fungus not uncommon in woods. — J. L. R.

J. P. S., Glen Falls, New York.—A quotation from Agassiz's Method of Study in Natural History, p. 276, will give you the desired information regarding the egg-cases of the cockle you speak of. "No one who has ever walked across sand beaches in summer can have failed to remark what the children call 'sand saucers.' The name is not a bad one, with the exception that the saucer lacks a bottom; but the form of these circular bands of sand is certainly very like a saucer with the bottom knocked out. Hold one of them against the light and you will see that it is composed of countless transparent spheres, each of the size of a small pin's head. These are the eggs of our common Natica, or Sea-snail. Any one who remembers the outline of this shell will easily understand the process by which its eggs are left lying on the beach in the form I have described. They are laid in the shape of a broad, short ribbon, pressed between the mantle of the animal and its shell, and, passing out, they cover the exterior of the shell, over which they are rolled up with a kind of glutinous envelope,—for the eggs are held together by a soft glutinous substance. Thus surrounded, the Natica, whose habit it is to burrow under the surface of the beach, soon covers itself with sand, the particles of which, in contact with the glutinous substance of the eggs, quickly forms a cement that binds the whole together in a kind of paste. When consolidated it drops off from the shell, having taken the mould of its form, as it were, and retaining the curve which distinguishes the Natica. Although these saucers look perfectly round, it will be found that the edges are not soldered together, but are simply lapped one over the other. Every one of the thousand little spheres crowded into such a circle of sand contains an egg."

W. L. T., Minneapolis, Minn.—The Philadelphia Vireo (*Vireosylvia Philadelphica* Cassin), taken by you at Minneapolis, and respecting whose history you enquire, is a species not yet very well known. It was first described by Mr. Cassin, from a specimen taken near Philadelphia, in 1851. Seven years later, when it was redescribed by Professor Baird; it was known also from Cleveland, Ohio, and Dane County, Wisconsin. In 1866, when mentioned again by Professor Baird, additional specimens had been received at the Smithsonian Institution from Maine, Moose Factory, H. B. T., and Guatemala. But a single specimen is thus far known from New England, taken by Professor C. E. Hamlin, at Waterville, Maine; it seems to be more common in the interior. In May, 1867, I found it one of the most common Vireos in Cook County, Illinois. It is hence known to have a wide distribution. In habits, as in size and general appearance, it greatly resembles the well known Warbling Vireo (*Vireosylvia gilva* Cass.). For descriptions of this species see Proc. Phil. Acad. Nat. Sci., vol. v, p. 153; Baird's Birds of North America, p. 335; Baird's Review of American Birds, p. 341.

The Yellow-bellied Flycatcher (*Empidonax flavirentris* Baird), respecting which you make a similar inquiry, is also a species imperfectly known. First described by Drs. S. F. and W. M. Baird, in 1843, from specimens taken in Pennsylvania, its range has since been found to extend throughout eastern North America, if not throughout the continent, but it appears to be nowhere very common. Its retiring habits, and close resemblance, at a little distance, to the more common species of its genus doubtless tend greatly to render its capture so relatively unfrequent. It shows a marked predilection for thickets and wooded situations. In Massachusetts it is more or less common in May, and towards the close of summer, but I am not aware that it has been seen here in the breeding season, although its breeding range is known to extend from the District of Columbia to Labrador. Its rather few but somewhat pleasing notes have been deemed by some to be worthy of being called a song. It is fully described in the later general works on North American Birds.—J. A. A.

BOOKS RECEIVED.

Sketch of the Life of Professor Chester Dewey. By M. B. Anderson. Albany, 1869. 8vo, pp. 11.

Contributions from the Sheffield Laboratory of Yale College. XX. *On Durangite a Fluo-Arsenate from Durango in Mexico.* By G. J. Brush. 8vo, pp. 4.

On the Meteoric Stone which fell December 5th, 1868, in Franklin Co., Alabama. By G. J. Brush. 8vo, pp. 4. *From the American Journal of Science and Arts, New Haven.*

American Bee Journal. Sept., Oct., 1869.

A Guide-Book of Florida and the South, for Tourists, Invalids and Emigrants, with a Map of the St. John River. By D. G. Brinton, M. D. Philadelphia, 1869. 12mo, pp. 136. Price $1.

Annals of Bee Culture for 1869, a Bee-Keeper's Year Book. D. L. Adair, Editor. Louisville, 1869. 8vo, pp. 57.

Popular Science Review. July. London.

Science Gossip. August, Sept., Oct. London.

Le Naturaliste Canadien. Quebec. July, September.

Canadian Naturalist and Geologist. June, 1869. Montreal.

Annals of the Lyceum of Natural History of New York. Vol. ix, Nos. 5, 6, 7. March—May, 1869.

Petites Nouvelles Entomologiques. Vol I. Bi-monthly. Nos 1-7. July 1 to Oct 1, 1869. Paris. E. Deyrolle, Fils.

Bulletin de la Societe Imperiale d'Acclimatation. VI. Jan. to Aug., 1869. Paris.

American Journal of Conchology. Vol. 5, Pt. 2, 1868. Philadelphia. Nos. 1-8.

Quarterly Journal of Science. Oct., 1869. London.

Scientific Opinion. Vol. II, Pt. xi. Oct., 1869. London.

George Peabody,

BORN IN DANVERS, MASS.,

FEBRUARY 18, 1795.

DIED AT LONDON,

THURSDAY, NOVEMBER 4, 1869.

Resolutions passed by the Peabody Academy of Science.

Resolved, — That the Trustees of the Peabody Academy of Science recognize, in the death of the distinguished founder of this Academy, the termination of a life actuated by a noble ambition to benefit and instruct mankind.

Resolved, — That here in his native county, among the many noble institutions he has founded, we are keenly sensible of the greatness of his work and the magnitude of our loss; yet a fame so pure and a life so grand leave nothing to be said in praise.

Resolved, — That, while the people of two continents are paying their tributes to his memory, we tender our sympathies to his kindred and friends in their bereavement; and rejoice that his life was prolonged to witness so much good accomplished by his wise and munificent charities, and the assurance of their great future usefulness.

Resolved, — That the President be instructed, in behalf of the Trustees, to coöperate with other institutions in paying proper respect to the memory of Mr. PEABODY, and in making the necessary preparations for his funeral.

Resolved, — That a copy of these Resolutions be sent to the immediate relatives of the deceased.